



Alameda County Airport Land Use Policy Plan

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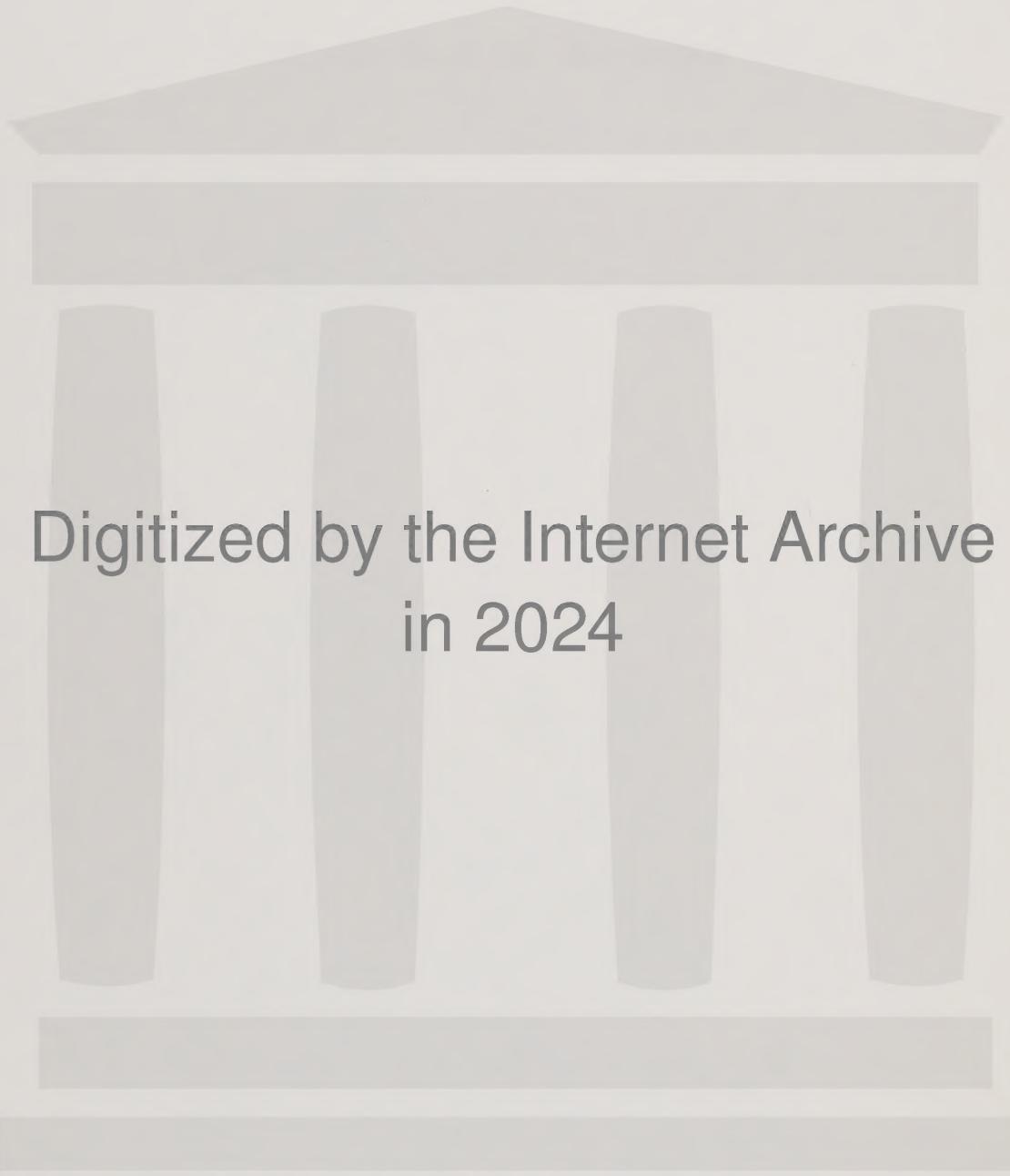
UNIVERSITY OF CALIFORNIA

AIRPORT LAND USE COMMISSION OF ALAMEDA COUNTY

ALAMEDA COUNTY

AIRPORT LAND USE POLICY PLAN

Adopted by
Alameda County Airport Land
Use Commission
August 10, 1977



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ALAMEDA COUNTY AIRPORT LAND USE COMMISSION

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GLOSSARY

air carrier aircraft: a commercial aircraft licensed by the state or federal government.

airport planning area: the Airport Land Use Commission has adopted a planning area for each public use airport in the County, based on such criteria as flight patterns (indicative of crash hazard areas and areas where high objects could interfere with air navigation) and noise contours. The planning area has been used to identify those public agencies which should be consulted during formulation of the airport land use plan.

ambient noise: a composite of noise which forms the residual level of noise (excluding aircraft operations) at a given location.

approach area: defined in Federal Aviation Administration Airport Development Aid Program, an area beyond the clear zone within which the FAA recommends limitations on land use in order to avoid interference with air navigation.

"A" weighted sound level (dBA): a sound pressure level in decibels corresponding to the way the human ear perceives sound.

civil aircraft: general aviation and commercial air carrier aircraft.

clear zone: defined in Federal Aviation Regulations Part 152.9b, a land or water surface extending beyond the primary runway surface within which no structures other than those serving air navigation should be erected.

community noise equivalent level (CNEL): the noise rating in decibels adopted by the State of California airport noise standards. It is a 24 hour average, weighting evenings and nighttime more heavily to compensate for greater sensitivity to noise at these times.

concentration of population: a gathering of people in an area that would yield a density of more than 25 people per acre over a 24 hour period (long term), or a single event that would yield a gathering of more than 50 people per acre for more than a two hour period (short term).

general aviation: all aircraft other than air carrier and military aircraft.

general referral area: the area near an airport which is now or could in the future be affected by airport operations. All projects within this area which may be inconsistent with the Policy Plan are to be referred by the public agency considering the project to the ALUC staff for advisory review.

height restriction area: area defined in and subject to Federal Aviation Regulations (FAR) Part 77, "Objects Affecting Navigable Airspace." Criteria for defining this area vary according to airport type. This area includes land on which tall objects, whether structures, equipment, or vegetation, could be hazardous to air navigation. Local zoning jurisdictions should adopt height restrictions enforcing FAR Part 77.

incompatible land use: any new land use, located within an airport impact area, which is inconsistent with the adopted airport land use plan.

noise impact area: as defined in the California airport noise standards, that area within the noise impact boundary devoted to existing incompatible uses, generally residential uses lacking special acoustical treatment. (California Administrative Code Section 5014)

noise impact boundary: the boundary is the criterion noise contour as established in the airport noise standards, Administrative Code Section 5012. Currently the recognized levels are 75 dB CNEL for airports with 4-engine turbojet or turbofan air carrier operations and at least 25,000 annual air carrier operations; 70 dB CNEL at other existing airports.

noise impact zone: the area recognized by the Airport Land Use Commission to be currently or in the future subject to significant levels of aircraft noise. Within this area noise/land use compatibility standards will be applied.

noise sensitive uses: these include, but are not limited to, residential, educational, and health-related activities.

normalized CNEL: an aircraft CNEL level adjusted to reflect the impact of aircraft noise in relation to ambient noise.

project: a new land use or change in existing use under consideration by a public agency. This definition includes any zoning or plan change, or major construction, but excludes minor actions such as alterations.

safety zone: area within which land uses should be limited according to height, density, and type because of crash hazards and potential interference with air navigation.

single event noise exposure level (SENEL): the noise exposure of a single event, such as an aircraft flyby, measured over the interval between the initial and final times for which the noise level of a single event exceeds the threshold noise level.

I. INTRODUCTION

A. ALAMEDA COUNTY AIRPORT LAND USE COMMISSION

Airport land use commissions are established by state law to coordinate new development in the vicinity of public use and military airports and to make recommendations which, by promoting the compatibility of new development with existing and planned airport operations, will protect the welfare of nearby inhabitants and the general public.¹ The commissions are generally countywide. Within Alameda County there are five airport areas for which the Airport Land Use Commission (ALUC) is responsible. This plan covers the three major public use facilities: Oakland Metropolitan International Airport (MOIA), which comprises both general aviation and air carrier facilities; Hayward Air Terminal, general aviation; and Livermore Municipal Airport, general aviation. At a later date the plan may be expanded to include the Fremont airport and Alameda Naval Air Station.

Of the seven ALUC commissioners, two, representing airports within the county, are appointed by the Airport Managers' Association; two, representing cities, are appointed by the Alameda County Mayors' conference; and two, county representatives, are appointed by the Board of Supervisors. The seventh commissioner is appointed by the other six to represent the general public. At the present time the public airport representatives are from the Hayward and Oakland airports, and the cities represented are Alameda and Union City. Appointments are four years in duration. The County Planning Director serves as administrative officer to the ALUC, and County planning staff provides technical assistance. In accordance with adopted bylaws, public meetings are held on the second Wednesday of each month.

B. THE POLICY PLAN

The intent of the Policy Plan is to provide guidelines for reviewing projects under consideration by public agencies to determine if these projects are compatible with current and anticipated airport operations. The review process applies only to proposed new development, although the impact findings on which plan policies are based can help to evaluate the compatibility of airport operations and existing development and to determine if mitigations are appropriate and feasible. Only projects which may be incompatible with the airport, as defined in the Policy Plan, need be referred to the Commission. Although the Alameda County Commission has adopted generalized planning area boundaries for each airport and an interim plan for the Bay Farm Island portion of the MOIA planning area,² the Airport Land Use Policy Plan represents the first comprehensive statement of guidelines and delimitation of airport impact areas within which these guidelines are to be applied.

Projects

A "project" of concern to the ALUC is any new land use under consideration by a public agency which may be affected by or affect airport activities. This definition includes plan changes, zoning changes, and major construction.

¹Public Utilities Code Article 3.5.

²Interim Plan for Bay Farm Island (superseded by this Policy Plan).

Noise and Safety Impacts

The Commission is concerned with "impacts" of normal airport activities which could adversely affect adjacent areas and aspects of near-airport land use which might interfere with airport operations. Most significant of these impacts are noise--particularly from jet engines--and crash hazards. For each airport area high noise and safety zones are proposed.

The noise and safety policies stated in Chapter II of the Policy Plan are generalized to apply to all airports in the County, while standards related to certain policies have been tailored to individual airport conditions.

Height Restriction and Referral Areas

The Plan defines for each airport a "height restriction area" corresponding to Federal Aviation Regulations (FAR) Part 77. It is recommended that each zoning jurisdiction adopt height restriction zoning in conformity with these regulations.

A smaller area near each airport is marked out as a "general project referral area," within which projects that may be incompatible due to noise or safety impacts are to be referred to the ALUC. Prior to final action by the referring agency, ALUC staff will examine the project and evaluate its conformity with Policy Plan guidelines. The Commission will be informed of all such referrals. Relevant findings on a proposed project will be conveyed to the referring agency.

If the jurisdiction approves an incompatible project, the ALUC will then hold a public hearing to determine if the project is in the best interests of the airport and the general public. Finally, if after the public hearing the ALUC judges that airport and public interests are not served by the project, the referring agency is required to hold a public hearing to reconsider the project. A four-fifths vote by the governing body of the agency is required to override the ALUC.

Plan Time Frame

By state law the Plan is "long range" -- approximately twenty years. This time frame can only be interpreted as a general guideline, as the Plan in fact contains various components of differing lifespans. Among the components hardest to project are future noise levels near an airport because of uncertainties as to the number of flights, future aircraft noise levels,¹ types of aircraft using an airport, and so forth. In summary, periodic amendment of the Plan can be expected in order to reflect changes in projected airport impacts, revisions in state and federal law and regulations, and new experience gained concerned the suitability of guidelines set by the ALUC.

¹The Federal Aviation Administration is responsible for adopting standards for aircraft noise emissions. The standards are spelled out in Federal Aviation Regulations Part 36 (FAR Part 36), which apply only to newly certificated aircraft and FAR Part 91, applicable to existing aircraft.

Relationship to Other Agencies

The Policy Plan complements the planning responsibilities of the cities, county, and other "affected agencies." While it is the responsibility of the ALUC to coordinate land use around the airport by identifying new uses compatible with accepted levels of airport operations and setting uniform policies and standards to prohibit development of incompatible uses, it is the responsibility of the cities and county through planning and zoning powers to specify which compatible uses are appropriate. These land use designations will naturally be based on consideration of a wider range of factors than simply compatibility with airport operations.

The Plan should also be consistent with airport goals, insofar as these goals conform to regional planning policies and take due account of environmental impacts.

There are specific limits to ALUC jurisdiction. The Commission has no authority over airport operations, although the ALUC Plan must include assumptions about future activities of the airport in question. Once adopted, the ALUC Plan is to serve as a framework for reviewing significant proposals for further airport development.¹ Secondly, Commission jurisdiction and plan scope are confined to land use-related primary impacts on the area immediately surrounding the airport. This definition excludes impacts affecting areas at a considerable distance from the origin or destination of a flight (for instance, noise from transit flights of aircraft). Air pollution is another impact which is of more regional scope and does not directly affect land use. The definition of relevant impacts also excludes "secondary" impacts, such as traffic or air pollution generated by vehicles of airport workers and patrons, which are not direct products of airport operations. These secondary impacts are more appropriately considered in the environmental impact report for the airport master plan and in regional planning studies.

Because the jurisdiction of the Commission is limited to new land uses, existing uses which are found to be in conflict with or injured by existing or anticipated airport operations will not be subject to the land use review policies established by the Commission. However, existing incompatible uses are the concern of the airport and of the city (or county) having jurisdiction over the affected area, and policies should be developed to handle this problem.

C. PLAN COORDINATION

The ALUC Policy Plan has been coordinated with the following plans:

*Plans for the Livermore Municipal Airport and the Hayward Air Terminal. The Metropolitan Oakland International Airport Master Plan is currently being revised. Port of Oakland staff have provided airport planning information and have issued a Draft Environmental Impact Report for the Airport Master Plan dated May 1977.

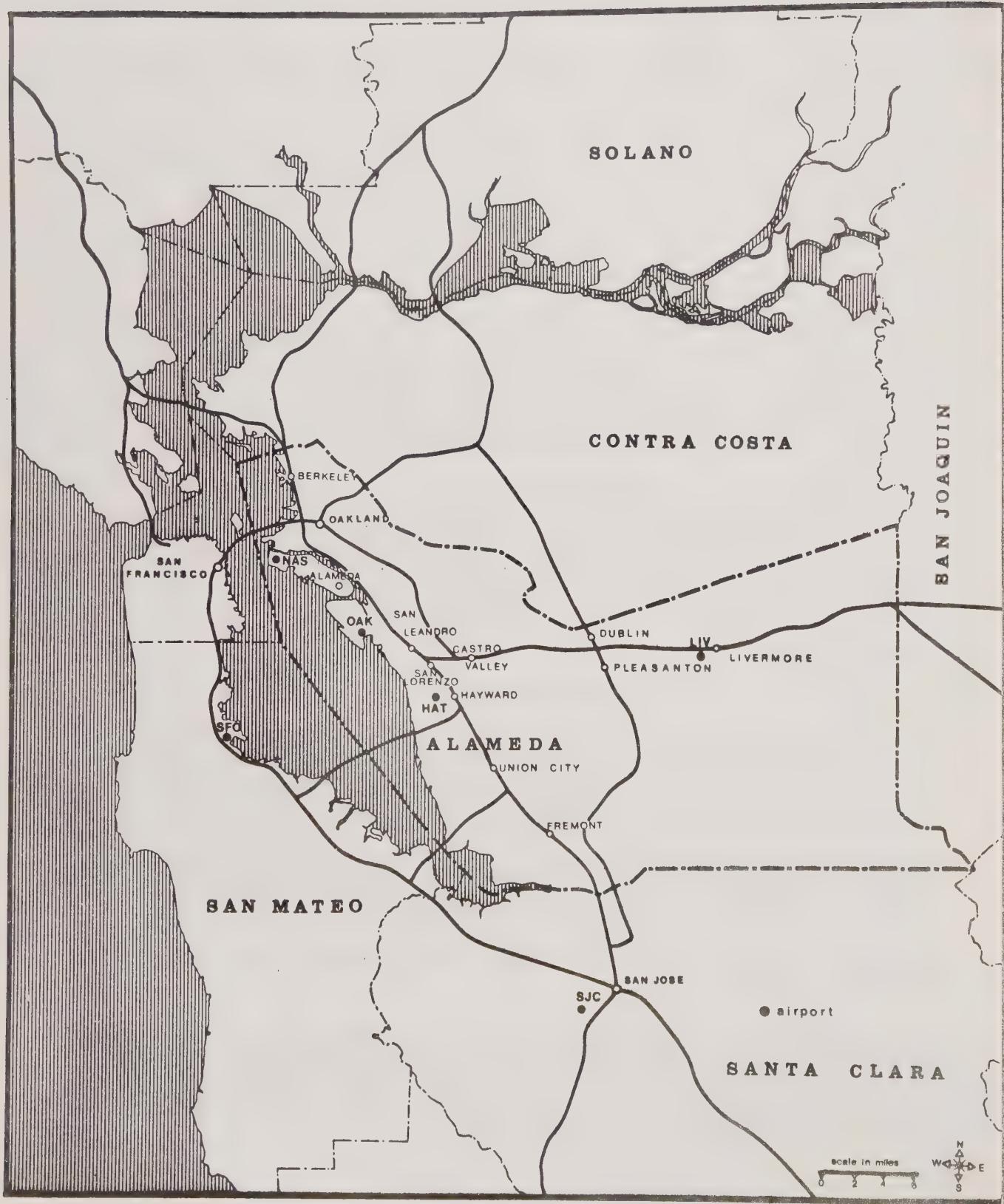
*General plans for Alameda County and the cities of Alameda, Hayward, Livermore, Oakland, Pleasanton and San Leandro. Of particular interest were the safety, noise, and land use and circulation elements.

*The Metropolitan Transportation Commission Regional Transportation Plan Aviation Element.

Also consulted were local and regional plans and studies from the Association of Bay Area Governments, Bay Area Air Pollution Control District, East Bay Regional Park District, Oakland Airport Transit Access Project, San Francisco Bay Conservation and Development Commission, and the State Office of Noise Control. All are listed in the Bibliography.

¹Public Utilities Code, Section 21676.

MAP I
REGIONAL SETTING



II. POLICIES AND STANDARDS

A. SAFETY POLICIES: CRASH HAZARDS

The purpose of crash hazards policies is to prevent development of land uses hazardous to air navigation and to limit the risk of a serious crash in hazard-prone areas near the airport. For the purpose of ALUC review, the following policies apply to proposed new development only.

1. Safety zones are established at both ends of all runways with the basic intent of limiting population density and structural development so as to avoid loss of life among population on the ground as well as among aircraft occupants in the event of an accident.

- 1.1 The standard safety zone dimensions shall be:

General aviation	. single runway: 1500' wide
aircraft up to 12,500 lbs.:	. dual runway: 750' wide from centerline of each runway plus the distance between runway centerlines
	. 3500' long, measured from end of runway
All jet aircraft and all	. single and dual
aircraft over 12,500 lbs.:	runway width as defined above
	. 5300' long, measured from end of runway

- 1.2 Alignment of safety zones shall reflect flight tracks.

- 1.3 At individual airports adjustments in zone dimensions may be required to reflect operating conditions.

2. Within the safety zones defined above, the following will be incompatible uses:

- 2.1 Any use which would direct a steady light or flashing light of red, white, green, or amber colors associated with airport operations toward an aircraft engaged in an initial straight climb following take-off or toward an aircraft engaged in a straight final approach toward a landing at an airport, other than an FAA approved navigational signal light or visual approach slope indicator (VASI).
 - 2.2 Any use which would cause sunlight to be reflected toward an aircraft engaged in an initial straight climb following take-off or toward an aircraft engaged in a straight final approach toward a landing at an airport.
 - 2.3 Any use which would generate smoke or which would attract large concentrations of birds, or which may otherwise affect safe air navigation within this area.
 - 2.4 Any use which would generate electrical interference that may be detrimental to the operation of aircraft and/or aircraft instrumentation.

3. In addition to the policies in #2 above, within the portion of the safety zone extending up to 1/4 mile (1320 feet) from the end of the runway, the following are defined as incompatible land uses:
 - 3.1 Permanent structures or objects projecting above the level of the primary surface of the runway.
 - 3.2 Any use which on a regular basis would result in a density (excluding streets) which would exceed 25 persons per acre at a time.
4. In addition to the policies in #2 above, within the portion of the safety zone extending beyond 1/4 mile (1320 feet) from the end of the runway, new uses should be non-residential, low density.
 - 4.1 Suggested uses are agriculture, open space, non-intensive recreation, warehousing and non-intensive industry, equipment storage.
 - 4.2 Uses should be excluded if they would result on a regular basis in a concentration of population exceeding 25 persons per acre over a 24 hour period or more than 50 persons per acre for more than 2 hours. In particular, new shopping centers, restaurants, schools, hospitals, arenas should not be permitted. Density calculations shall exclude streets.
5. All proposed new land uses located within the safety zones will be reviewed for compatibility with these policies.
6. Proposed exceptions to these land use standards will be considered on a case-by-case basis by the Airport Land Use Commission.
7. In areas where existing uses result in a population density and/or character of development incompatible with the above policies, and where local governments find mitigation measures are not available to them, airport operations should be reviewed for possible actions to mitigate crash hazards.

B. SAFETY POLICIES: HEIGHT

The purpose of these policies is to preserve unimpeded airspace required for safe air operations in the vicinity of the airport.

8. The airport land use plan height restriction area for each airport coincides with the navigable airspace requirement for that airport as defined in accordance with standards set forth in FAR Part 77.
9. In accordance with standards set forth in FAR Part 77, height limits will be established on new structures and vegetation within the height restriction boundary.
10. To enforce FAR Part 77 standards, it is recommended that local jurisdictions adopt height restriction zoning conforming to these standards.¹

¹ Appendix F.

C. NOISE POLICIES

11. The Commission endorses the California airport noise standards¹ as a means to control and reduce airport noise impact. Land use compatibility standards adopted in the Policy Plan shall be at least as restrictive as those in the noise standards.
12. The Commission recognizes the state uniform minimum noise insulation performance standards² for new residential units other than single-family detached dwelling units and the general plan noise element requirements.³
 - 12.1 Because local cities and counties are required by State law to incorporate in their building codes standards at least as restrictive as those set by the State, the Commission recognizes the noise insulation standards of the local jurisdictions affected by the Commission Airport Land Use Plan.
 - 12.2 The Commission recognizes the State Office of Noise Control "Guidelines for the Preparation and Contents of Noise Elements of the General Plan."⁴
13. The Commission adopts Table I, "Land Use Compatibility for Airport Noise Environments," for use in evaluating projects within the noise impact zones.
14. Table II, "Adjustments to the Measured Community Noise Equivalent Level (CNEL) to Obtain Normalized CNEL," is adopted for use in determining need for normalization of the aircraft CNEL at a specific project site.
 - 14.1 The normalization factor for Bay Farm Island is zero (0).
15. Sound insulation is required to insure a maximum interior 45 dB CNEL in new residential, educational, and health-related uses in aircraft noise areas.
 - 15.1 For new development within 500 feet north of the 65 CNEL line of demarcation on Bay Farm Island insulation shall meet the standards established in this Plan, based on an assumed exterior 65 CNEL.
 - 15.2 The ALUC shall accept a certification from local building officials that under the local building construction ordinance insulation is adequate to meet the standards adopted in this ALUC Plan.
16. Each project in a location with a "conditionally acceptable" CNEL range for that use, as defined in Table I, will be considered consistent with the Plan if it is found that:
 - 16.1 Project design provides for insulation adequate to reduce interior noise to level acceptable for that use, as defined in the Plan.
 - 16.2 The land use is in conformity with height and safety policies.
 - 16.3 The basic intent of the Airport Land Use Policy Plan in protecting public health, safety, and welfare is not violated.

¹California Administrative Code, Sections 5000-5032.

²California Health and Safety Code, Sections 17922.6 and 17922.7.

³California Government Code, Section 65302(g).

⁴Adopted February 1976.

16.4 New residential development shall be allowed between the 65-70 CNEL lines of demarcation of Bay Farm Island if the property is subject to a noise easement and if insulation standards defined in this Plan for 70 CNEL exterior noise are met.

17. The Commission adopts the following maps, which show planning lines of demarcation denoting ranges of noise exposure (based on CNEL, not normalized):

17.1 Hayward Air Terminal, MAP X. The lines of demarcation are based on projection to 1990 of annual CNEL's ranging between 60 and 70 dB.¹

17.2 Livermore Municipal Airport, MAP XIV. The lines of demarcation are based on projection to 1995 of CNEL's ranging between 60 and 65 dB.²

17.3 Oakland Airport.³

Map VI - departures (Bay Farm Island). The lines of demarcation correspond to current annual CNEL's ranging between 60 and 75 db.³

Map VII - approaches (San Leandro). The lines of demarcation are based on projection to 1981 of annual CNEL's ranging between 65 and 70 dB.⁴

The noise monitoring to be conducted by the Port of Oakland pursuant to the state noise standards shall be used to validate the location of the 65 dB CNEL line of demarcation Bay Farm Island.

D. IMPLEMENTATION POLICIES

The following section, outlining procedures for referring and reviewing projects within ALUC jurisdiction, supplements established ALUC Bylaws and procedures.

Relationship of the Airport Land Use Policy Plan to Local Cities, the County, and regional planning

ALUC policies will be coordinated with regional planning and, through this regional coordination, will seek to promote a balance of airport activities and the welfare of the surrounding Bay Area communities.

18. It is recommended that all zoning jurisdictions affected by height restriction area around an airport adopt height restrictions in accordance with FAR Part 77.⁵

19. It is recommended that local jurisdictions adopt procedures to ensure that prospective property owners in aircraft noise exposure areas of current and anticipated 65+ dB CNEL are informed of these noise levels and of any land use restrictions associated with high noise exposure.

¹Contours prepared by Bolt, Baranek and Newman, 1974; Hayward Airport Plan.

²August W. Compton and Associates, Livermore Airport Master Plan, 1975.

³65 line -- Settlement Agreement line of demarcation (Settlement Agreement between the Port of Oakland, City of Alameda, Harbor Bay Isle Associates, and Reclamation District 2105, July 1976); 60, 70 and 75 lines from Alameda Noise Element, Community Noise Environment Map.

⁴Oakland Airport Master Plan Draft Environmental Impact Report, May 1977.

⁵The FAA has issued "AC 150/5190-3A," a model airport hazard zoning ordinance (Appendix F).

- 19.1 To facilitate implementation of this policy the ALUC shall evaluate alternative means of notification and make recommendations based on this evaluation.
- 19.2 Depending upon the findings of the ALUC study of notification, for new development within 500 feet north of the 65 CNEL line of demarcation on Bay Farm Island, it is recommended that the City of Alameda adopt procedures to ensure that prospective property owners are informed of the current and anticipated airport noise impact, as recognized in this Plan.
20. It is recommended that affected zoning jurisdictions adopt crash hazard zones and land use policies; noise/land use compatibility standards; and comprehensive sound insulation standards consistent with those of the ALUC Policy Plan.

Project Referral and Review

21. The ALUC may be notified of any proposed project within the general project referral areas for the Oakland/Hayward and Livermore airports which may be inconsistent with the Policy Plan.
 - 21.1 Project referral may be made to ALUC staff for informal review prior to final action by the agency.
 - 21.2 The agency referring a proposed project is requested to include a description of the site location, existing and proposed uses, and any other pertinent information.
22. ALUC staff shall review a referred project to evaluate its consistency with the adopted Policy Plan. The referring agency shall be notified of the staff evaluation within 15 days of the date of referral, prior to final action by the referring agency.
 - 22.1 The ALUC shall be informed of the referred project at its next monthly meeting.
23. Projects on property through which a 65 CNEL line of demarcation passes (70 CNEL on Bay Farm Island, where noise easement and insulation standards of this Plan are met) shall be referred to the Commission for evaluation on a case-by-case basis for land use compatibility and appropriate noise mitigation.
24. If a project which may be inconsistent with the Policy Plan is approved by the involved agency, an ALUC hearing shall be scheduled:

The commission shall hold a hearing to determine whether or not the proposed action is in the best interest of the airport and the adjacent area. If it is determined that the action would be harmful, then the public agency shall be notified and the public agency shall have another hearing to reconsider its action.
25. Public agencies owning airports shall submit any airport development plans which would have the potential to alter impacts of airport operations on surrounding lands.

Each public agency owning any airport within the boundaries of the plan area shall file any substantive change in development plans with the commission for its approval. If such plans are inconsistent with the commission plan, then the public agency shall be notified and shall have another hearing to reconsider its action.²

¹California Public Utilities Code, Section 21676.

²California Public Utilities Code, Section 21676.

26. Any interested party believing an action taken by a public agency to be inconsistent with the Policy Plan may bring this action to the attention of the Commission.
 - 26.1 A written statement describing the project and identifying the agency involved should be submitted to the ALUC Administrative Officer at least 10 days prior to the next regular meeting of the Commission.
 - 26.2 The request for review will be considered by the ALUC at its next meeting. The public agency involved will be requested to delay implementation pending receipt of an ALUC recommendation.

TABLE I

Land Use Compatibility for Airport Noise Environments

LAND USE CATEGORY	COMMUNITY NOISE EXPOSURE Ldn OR CNEL, dB						INTERPRETATION
	55	60	65	70	75	80	
RESIDENTIAL - LOW DENSITY SINGLE FAMILY, DUPLEX, MOBILE HOMES			■■■■■				
RESIDENTIAL - MULTI. FAMILY			■■■■■		■■■■■		
TRANSIENT LODGING - MOTELS, HOTELS			■■■■■	■■■■■			
SCHOOLS, LIBRARIES, CHURCHES, HOSPITALS, NURSING HOMES			■■■■■		■■■■■		
AUDITORIUMS, CONCERT HALLS, AMPHITHEATRES	■■■■■	■■■■■	■■■■■	■■■■■			
SPORTS ARENA, OUTDOOR SPECTATOR SPORTS	■■■■■	■■■■■	■■■■■	■■■■■			
PLAYGROUNDS, NEIGHBORHOOD PARKS	■■■■■	■■■■■	■■■■■	■■■■■			
GOLF COURSES, RIDING STABLES, WATER RECREATION, CEMETERIES	■■■■■	■■■■■	■■■■■	■■■■■			
OFFICE BUILDINGS, BUSINESS COMMERCIAL AND PROFESSIONAL	■■■■■	■■■■■	■■■■■	■■■■■			
INDUSTRIAL, MANUFACTURING UTILITIES, AGRICULTURE	■■■■■	■■■■■	■■■■■	■■■■■			

INTERPRETATION



NORMALLY ACCEPTABLE

Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.



CONDITIONALLY ACCEPTABLE

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.



NORMALLY UNACCEPTABLE

New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.



CLEARLY UNACCEPTABLE

New construction or development should generally not be undertaken.

CONSIDERATIONS IN DETERMINATION OF NOISE-COMPATIBLE LAND USE

A. NORMALIZED NOISE EXPOSURE INFORMATION DESIRED

Where sufficient data exists, evaluate land use suitability with respect to a "normalized" value of CNEL or Ldn. Normalized values are obtained by adding or subtracting the constants described in Table 1 to the measured or calculated value of CNEL or Ldn.

Community Noise Exposure Areas greater than 65 dB should be discouraged and considered located within normally unacceptable areas.

B. NOISE SOURCE CHARACTERISTICS

The land use-noise compatibility recommendations should be viewed in relation to the specific source of the noise. For example, aircraft and railroad noise is normally made up of higher single noise events than auto traffic but occurs less frequently. Therefore, different sources yielding the same composite noise exposure do not necessarily create the same noise environment. The State Aeronautics Act uses 65 dB CNEL as the criterion which airports must eventually meet to protect existing residential communities from unacceptable exposure to aircraft noise. In order to facilitate the purposes of the Act, one of which is to encourage land uses compatible with the 65 dB CNEL criterion wherever possible, and in order to facilitate the ability of airports to comply with the Act, residential uses located in Com-

C. SUITABLE INTERIOR ENVIRONMENTS

One objective of locating residential units relative to a known noise source is to maintain a suitable interior noise environment at no greater than 45 dB CNEL or Ldn. This requirement, coupled with the measured or calculated noise reduction performance of the type of structure under consideration, should govern the minimum acceptable distance to a noise source.

D. ACCEPTABLE OUTDOOR ENVIRONMENTS

Another consideration, which in some communities is an overriding factor, is the desire for an acceptable outdoor noise environment. When this is the case, more restrictive standards for land use compatibility, typically below the maximum considered "normally acceptable" for that land use category, may be appropriate.

SOURCE: California Office of Noise Control, "Guidelines for the Preparation and Content of Noise Elements of the General Plan," February, 1976.

Table II

Adjustments to the
Measured Community Noise Equivalent Level (CNEL)
to Obtain Normalized CNEL

Type of Correction	Description	Amount of Correction to be Added to Measured CNEL in dB
Seasonal Correction	Summer (or year-round operation). Winter only (or windows always closed).	0 - 5
Correction for Outdoor Residual Noise Level	Quiet suburban or rural community (remote from large cities and from industrial activity and trucking). Quiet suburban or rural community (not located near industrial activity). Urban residential community (not immediately adjacent to heavily traveled roads and industrial areas). Noisy urban residential community (near relatively busy roads or industrial areas). Very noisy urban residential community.	+10 + 5 0 - 5 -10
Correction for Previous Exposure and Community Attitudes	No prior experience with the intruding noise. Community has had some previous exposure to intruding noise but little effort is being made to control the noise. This correction may also be applied in a situation where the community has not been exposed to the noise previously, but the people are aware that bona fide efforts are being made to control the noise. Community has had considerable previous exposure to the intruding noise and the noise maker's relations with the community are good. Community aware that operation causing noise is very necessary and it will not continue indefinitely. This correction can be applied for an operation of limited duration and under emergency circumstances.	+ 5 0 - 5 -10
Pure Tone or Impulse	No pure tone or impulsive character. Pure tone or impulsive character present.	0 + 5

SOURCE: California Office of Noise Control, "Guidelines for the Preparation and Content of Noise Elements of the General Plan", February 1976.

III. AIRPORT LAND USE PLANS

This chapter of the Policy Plan delineates the specific areas near Alameda County airports to which noise, height restriction, and safety (crash hazard) policies are to be applied. In this Plan these areas are termed "impact zones." Both the extent of the zones and the policies applicable to them take into consideration estimated future as well as current conditions. Thus, for example, policies for noise/land use compatibility and sound insulation must be applied by weighing forecast future levels of aircraft noise along with current levels at the site of a proposed project.

In this comparison of current and future conditions, the Plan policies and impact zones seek to ensure that for the foreseeable time frame, at least, any new development will be compatible with legitimate airport operations. Obviously, this is a complex and critical task: development today of airport-sensitive land uses can become a future constraint on airport operations. On the other hand, anticipation of future airport impacts can constrain near-airport development. For this reason, the Airport Land Use Policy Plan places emphasis on "legitimate" airport operations--current and future--as defined in an adopted airport master plan and environmental impact report, and in conformance with local, state and federal law. This is in accord with the requirement that the Airport Land Use Commission Plan "include a long-range master plan that reflects the anticipated growth of the airport."¹

Rewards to both zone boundaries and policies may be undertaken as necessary. Changes in the state and federal laws and regulations backing up the noise, height, and safety policies would, for example, call for updating of the affected policies. Changes in airport operations affecting near-airport areas could provide reasons for modification of zone boundaries.²

The proposed policies applicable to the noise, height, and crash hazard zones have been presented to the Commission in background reports and are included in this Plan.³ Since these policies are applicable only to new development, the Airport Land Use Commission Policy Plan cannot be expected to eliminate all problems of airport/land use compatibility. The Commission has no jurisdiction over airport operations, although it may make recommendations to alleviate existing problems or avoid anticipated conflicts, and following adoption of an Airport Land Use Plan it does have the responsibility of reviewing proposed substantive changes in airport development plans. An additional major check on Commission power stems from the authority of the governing body of a public agency considering a proposed project to override an adverse Commission decision by a 4/5's vote.

A. METROPOLITAN OAKLAND INTERNATIONAL AIRPORT (MOIA)

Height Restriction Area

Map II delineates the extent of Federal Aviation Regulations (FAR) Part 77 surfaces for MOIA. Affected zoning jurisdictions should adopt height restrictions to enforce FAR Part 77 limits.

¹California Public Utilities Code, Section 21675.

²Proposed significant changes in the airport plan must be submitted for ALUC review, however (California Public Utilities Code, Section 21676.)

³Background reports: "Safety and Safety Policies" and "Noise and Noise Policies," June 1976.

General Referral Area

The proposed general referral area for the Metropolitan Oakland International Airport, depicted in Map III, encompasses the zones affected by (1) significant levels of airport noise and (2) crash hazards. All land within the general referral area is also subject to Federal Aviation Regulations Part 77, imposing height restrictions on development. The boundaries for the referral area have been selected, using convenient urban features such as streets, so as to take in not only impact zones but the major near-airport transportation routes and land uses which form the airport environs. Because of proximity to Hayward Air Terminal, airport impacts overlap; thus, a combined referral area is indicated.

Public agencies considering any proposed projects within the general referral area are asked to examine the projects for consistency with the Policy Plan. Potentially incompatible projects should be referred to the Commission. In the vicinity of the Oakland Airport the three agencies most directed concerned with land use within the general referral area are the cities of Alameda, Oakland and San Leandro. Small portions of the City of Hayward and the unincorporated community of San Lorenzo are also included.

Noise and Safety Zones

Maps IV and V depict the safety zone boundaries. Since approaches and departures for runway 29/11 are over water, safety zones are not applied here. On Maps VI and VII are noise zones.

Background Information: MOIA

The Metropolitan Oakland International Airport (MOIA) combines general aviation, commercial airline, and aircraft maintenance facilities on its 2,580 acre site. The Airport is located six miles south of central Oakland and is within the City of Oakland jurisdiction, although its northwestern boundary is shared with the City of Alameda and part of the southeastern boundary with the City of San Leandro.

1. South Airport

The Bay Area is served by three commercial airports: Oakland (at the South Airport), San Francisco, and San Jose. A 1975 survey found that commercial air passengers at the Oakland Airport were approximately 11% of the total Bay Area (as compared with roughly 76% at the San Francisco Airport and the balance at San Jose).¹

At present, the majority of Oakland Airport users travel within the "California corridor";² the Airport accommodates only slightly over 5% of the Bay Area domestic (non-corridor) and international traffic. These South Airport facilities are also used for commercial airline training and for those general aviation aircraft prohibited from use of the North Field.

¹Metropolitan Transportation Commission, Air Passenger Survey, San Francisco Bay Area, August 1975, p. 19.

²The "California corridor" includes all areas in the state, although most traffic is between the Bay Area and Southern California.

Opinions and forecasts vary as to the future regional role and air traffic volume of the South Airport. The capacity of the single 10,000 foot runway (29/11) is at least 13 million annual passengers (MAP). Although in the early 1970's the traffic volume was forecast to expand greatly within the next 15 years (from 2 MAP in 1970 to 24 MAP in 1985)¹, actual growth has been minimal (2.2 MAP in 1975). This situation is consistent with the regional and national experience for the same period, as air traffic has been affected by a complex and abrupt shift in economic conditions. Oakland South Airport allocations for 1986-1989 (by the Metropolitan Transportation Commission) have been scaled down recently to the 7-8 MAP range, while MTC staff forecasts are lower still: 3.8-4.5 MAP in 1986 if no redistribution in airline service occurs. Finally, the Port of Oakland is currently using a 6 MAP (1986) estimate for planning purposes.

If and when growth at the Airport will approach the present capacity -- or even 6 MAP -- is unclear. However, these matters of scale and timing have major significance for surface traffic, noise, safety, air quality, and other products of airport activity. For example, slower expansion of commercial and other jet activities could allow incorporation of better sound attenuation technology in this growth.² Viewing the Oakland South Airport from the standpoint of its regional role and comparing its location and capacity with the San Jose and San Francisco airports, the Metropolitan Transportation Commission contends that Oakland Airport offers the best opportunities for major increases in runway capacity for airline operations.³ According to Metropolitan Transportation Commission, as the San Francisco Airport moves up from its current 80% use of capacity, airline services could be diverted to Oakland and San Jose. MTC argues that the convenient location of the Oakland Airport for East Bay population⁴ and improved public transit will encourage this expansion.

2. North Field

Opened in 1927, the North Field is a general aviation facility used primarily for light single and twin-engine and light turboprop aircraft. Commercial aircraft maintenance facilities are also located here. The North Field is equipped for instrument landing and has two main parallel runways (27R/9L and 27L/9R) and a crosswind runway (15/33) for light aircraft. A recent resolution by the Board of Port Commissioners, which manages the Airport, has prohibited take-offs from 27R/L and landings on 9R/L of all turbojets and turbofans, turboprops over 12,500 pounds, and all four engine reciprocating engine aircraft under most conditions.

¹Association of Bay Area Governments, Regional Airport Systems Study, Final Plan, p. 1.1.

²See MTC, "Aviation Noise," Regional Airport Plan Update Program, Phase I, August 1975.

³MTC, Regional Airport Plan Update Program, Phase I, p. 124.

⁴Of the total Bay Area airline passengers, only half are residents, however; visitors tend to be located in San Francisco.

However, it is likely that the 27 runway complex would be used for these aircraft and commercial flights whenever major repairs are being made to South Airport runway 29/11 or during inclement weather.

Under the Board resolution, the future of the North Field would appear limited to light, non-jet aircraft, which make up approximately 95% of the general aviation operations at the Metropolitan Oakland International Airport.

3. Land Use On and Near the Airport

As mentioned previously, the airport falls within City of Oakland jurisdiction, with airport planning and operation carried on by the Port of Oakland.¹ Of the total airport area, over 44% (1,150 acres, 990 at the South Airport) is undeveloped, and the location and type of any expansion of airport facilities, industry, or related activities will have repercussions for the surrounding areas. The greatest impact would likely be in Alameda (on Bay Farm Island), although areas in San Leandro and Oakland, (for instance, near San Leandro Bay) would also be affected.

4. Safety Zones Near MOIA

The areas most subject to crash hazards are near both ends of a runway, within 1/2 to 1 mile depending on the type of aircraft operations. Since the approach and departure for South Field runway 29/11 are over water, only lands near the North Field 27/9 runways and runway 15/33 are of concern for the proposed safety policies. In applying these generalized policies to a particular runway, adjustments may be required to take into account the type of air operations (flight tract, aircraft weight, engine type), frequency of flights, and degree to which lands within the recommended zone are already "committed" to particular uses. The areas to be included in safety zones for Oakland Airport North Field are shown in Maps IV and V. As defined previously, the minimum dimensions are:

General aviation	. single runway: 1500' wide
Aircraft up to 12,500 lbs.:	. dual runway: 750' wide from centerline of each runway plus the distance between runway centerlines. . 3,500' long, measured from end of runway.
All jet aircraft and all aircraft over 12,500 lbs.:	. runway width as defined above. . 5,300' long, measured from end of runway.

Policies for new land uses within the first quarter mile from the end of the runway emphasize maintenance of clear space; beyond this distance new uses should be low density, limited building coverage, non-residential.

¹The Oakland City Charter establishes the Port as a relatively autonomous department (Article VI, Section 600 et. seq.).

Analysis of land use and development policies for the safety zones

Zones shown for the area within the City of Alameda correspond to those adopted by the City in the Airport Safety Study for its Safety Element, both in terms of dimensions and policies for new land uses.¹

Zones for Runway 33/15 are over Airport property and San Leandro Bay. Given this location, it is unlikely that questions of development will arise; however, the Airport Land Use Commission policies would be applicable for areas within its jurisdiction.

Within zones in Alameda off runways 27/9 most of the land has been developed:

<u>LAND USE</u>		<u>ACRES</u>
Inner $\frac{1}{4}$ mile	Airport	53
	Golf Course	25
	Undeveloped	2
Outer Zone	Airport	3
	Golf Course	57
	Developed Residential	
	Single Family	96
	Townhouses	45
	Undeveloped	23

Existing population density of the residential areas is approximately 26 persons per acre.²

Although there are no high density uses such as commercial complexes or outdoor arenas in the safety zones, the existence of extensive moderate-density residential development in those zones under the straight-out take-off flight tracks from Runways 27R and 27L does represent a less-than-optimal situation according to both Airport

¹City of Alameda Airport Safety Study, adopted September, 1976.

City of Alameda safety zone dimensions (p. 47):

Zone A: (closest to runway)--1400' length; 1500' width.

Zone B: (contiguous to A) -- 3900' length; 1500' width.

Land use policies (assuming existing North Airport operating conditions):

Zone A: 1. No structure or object should be erected or permitted to grow above the primary surface of the runway, with the exception of structures to aid navigation.

2. Land should be graded and turfed.

Zone B: 1. Land use should be non-residential and restricted to the following uses: (a) agriculture; (b) recreation/parks; (c) equipment storage/corporation yards; (d) single story auto parking; (e) single story, limited-occupancy warehousing; (f) single story, limited occupancy municipal activities (e.g. sewage treatment plants).

²Alameda, Airport Safety, p. 31.

Land Use Commission and City of Alameda policies. The risk to residents in these zones is reduced by the infrequency of heavy aircraft flights using these straight-out tracks.¹ While the recommended policies should hold for new development, relocation of existing homes has little justification given current North Field operating conditions. On the other hand, the development within these safety zones in Alameda may be considered a constraint on operations from the 27 runway complex due to the risk entailed in expansion of straight-out flights, particularly of aircraft over 12,500 pounds.

Lands in Oakland and San Leandro are included in the safety zones under the approaches to the Runway 27 complex. Land uses here are generally compatible:

USE	ACREAGE	JURISDICTION
Inner $\frac{1}{4}$ mile	Airport	78
Outer zone	Golf Course	145
	Industrial	81
		San Leandro, Oakland

5. Noise impact zone: MOIA

Delineation of the boundaries of the noise impact zone has resulted from a weighing of several factors.

- * The Commission must take into consideration anticipated noise levels: its new policies should insure that for the time span of the Policy Plan new development will not become incompatible with noise from airport operations, according to the "criterion" noise levels defining incompatibility.²
- * Commission policies should be consonant with state airport noise standards and adopted airport master plans. The policies should also coordinate with local plans seeking to regulate noise impact.
- * The Commission may choose to recognize zone boundaries which do not correspond to a specific CNEL but which reflect noise variation expected over time, community sensitivity, land use factors, and other relevant variables.

In establishing and implementing land use policies based on CNEL contours averaged over a year, the Commission assumes that the noise produced by operations at the airport is in fact "legitimate", (i.e. consistent with the planned service level) and that the noise levels recognized reflect feasible abatement procedures. The Airport Land Use Commission relies on the processes involved in reviewing and adopting an airport master plan and the noise and land use elements of a community general plan to investigate alternative noise impacts and abatement procedures.

¹The Airport Safety study for Alameda estimates that these flights are less than one percent of IFR departures from Runways 27L and 27R.

²See Table I.

Regulating new land use on the basis of current or anticipated noise impacts should only be undertaken when an overriding public interest (the availability of public airport facilities and services) has been established.

5.1 Findings: Aircraft noise levels (Bay Farm Island)

Not all current contours and projections of noise impact on BFI depict a range of CNEL contours, concentrating instead on the 65 CNEL. None of the various projections use a composite noise measure and none include onground aircraft noise.

The "margin of tolerance" for CNEL measures is \pm 1.5-3.0 decibels; forecast "accuracy" depends on validity of technical assumptions.

Current noise levels

- "Current" CNEL's on Bay Farm Island (BFI) range from slightly below 60 to 76 dB.¹ This is true whether San Francisco overflights are included or only aircraft noise from Oakland is considered.
- BFI lies within the 60 dB CNEL from San Francisco airport,² which adds approximately 1.2 dB to a 65 CNEL from Oakland Airport.
- All of the developed, residential area of BFI is exposed to noise between 60-70 dB CNEL.
- Of the 550+ acres of undeveloped residentially-zoned land on BFI, 140 acres lie within the "current" 65 CNEL³ recognized by the City of Alameda in its Noise Element. This 65 CNEL, which reflects only MOIA departures and assumes no jet operations on the North Field, is generally equivalent to the "line of demarcation" recognized in the Settlement Agreement.

Future noise levels

Recent MTC forecasts⁴ for Oakland (given "no change in airline service") range 3.8-4.5 MAP (1986) and 4.5-6.3 (1996). Higher MAP's could result from efforts to redistribute Bay Area airline service. The Regional Transportation Plan has adopted ranges for Oakland Airport of 7-8 MAP (1989) and 10-13 MAP (2001).

Estimates of noise from Oakland operations to 1996 vary considerably, depending on the assumed service level, number of operations, fleet mix, aircraft noise levels, and airport operating policies. More information is available for South Airport departures than for approaches because the recently issued Wyle/Thompson study excludes approaches over San Leandro and Hayward.

¹Wyle Labs, CNEL Contour Study for MOIA, pp. 4-3 - 4-5 (prepared for the City of Alameda Noise Element, 1976); and Bolt, Baranek and Newman, "1973-1974 CNEL contours (MOIA)", in Port of Oakland, Draft Environmental Impact Report for the Airport Master Plan, May 1977.

²Wyle Labs "CNEL's: San Francisco International Airport," in Alameda, Noise Element, pp. 37-39.

³Noise Element, p. 91.

⁴Metropolitan Transportation Commission, "Passenger Forecasts and Airport Allocations," January 1977.

- Assuming growth in air carrier activity to accommodate 5-7.5 MAP within the next ten years, aircraft compliance with FAR 36, and continuation of Port Resolution 23150, only minor increase over current noise levels would occur. The CNEL band might shift north 400-500 feet over portions of the Highlands on Bay Farm Island.
- Noise forecasts for a longer-range period cannot be made with confidence. Although the Regional Transportation Plan has suggested 10-13 MAP at Oakland between 1996-2001, an analysis of the noise associated with this service level has not been made yet. For land use planning purposes, it seems reasonable to assume that the area near the airport will continue to experience noise levels at least as high as at present, although the composition of that noise environment will shift toward increased numbers of relatively quieter aircraft. If, in the future, information indicates that the noise levels are likely to increase significantly, ALUC impact zones should be redrawn.

5.2 Constraints on the level of MOIA operations:

Noise impact on existing residences -- the Airport will have a noise problem in 1986, when the 65 CNEL becomes the criterion level for the California Airport Noise standards, unless noise reduction places the 65 CNEL south of Catalina Avenue or other means of compliance are developed. Since most forecasts consider this degree of noise reduction unlikely, the Port may look to measures such as noise easements.

Although the Port's Master Plan EIR predicts a noise impact over existing residences, the Port has yet to formulate a compliance program. Map XV and Table III provide additional information on potential noise levels and impacts.

There are significant noise and safety constraints on the use of the North Field by jets and heavy aircraft. Developed neighborhoods lie within the safety zones for straight-out departures from the North Field. Use of the North Field by business jets, assuming current levels of aircraft noise emissions and traffic volumes at MOIA, would place virtually all residential areas of BFI within a 65 CNEL. To prevent this noise problem, the Port has adopted Resolution 23150.

Access capacity of the road and transit system -- without development of Harbor Bay Isle, access capacity of the transportation system serving MOIA is close to 6 MAP.

Air quality -- air quality impact of MOIA is being studied for the Airport Master Plan EIR.

MAP II

MOIA HEIGHT RESTRICTION AREA

(FAR 77 Surfaces)



Source: MOIA Draft Master Plan, 1975

1977

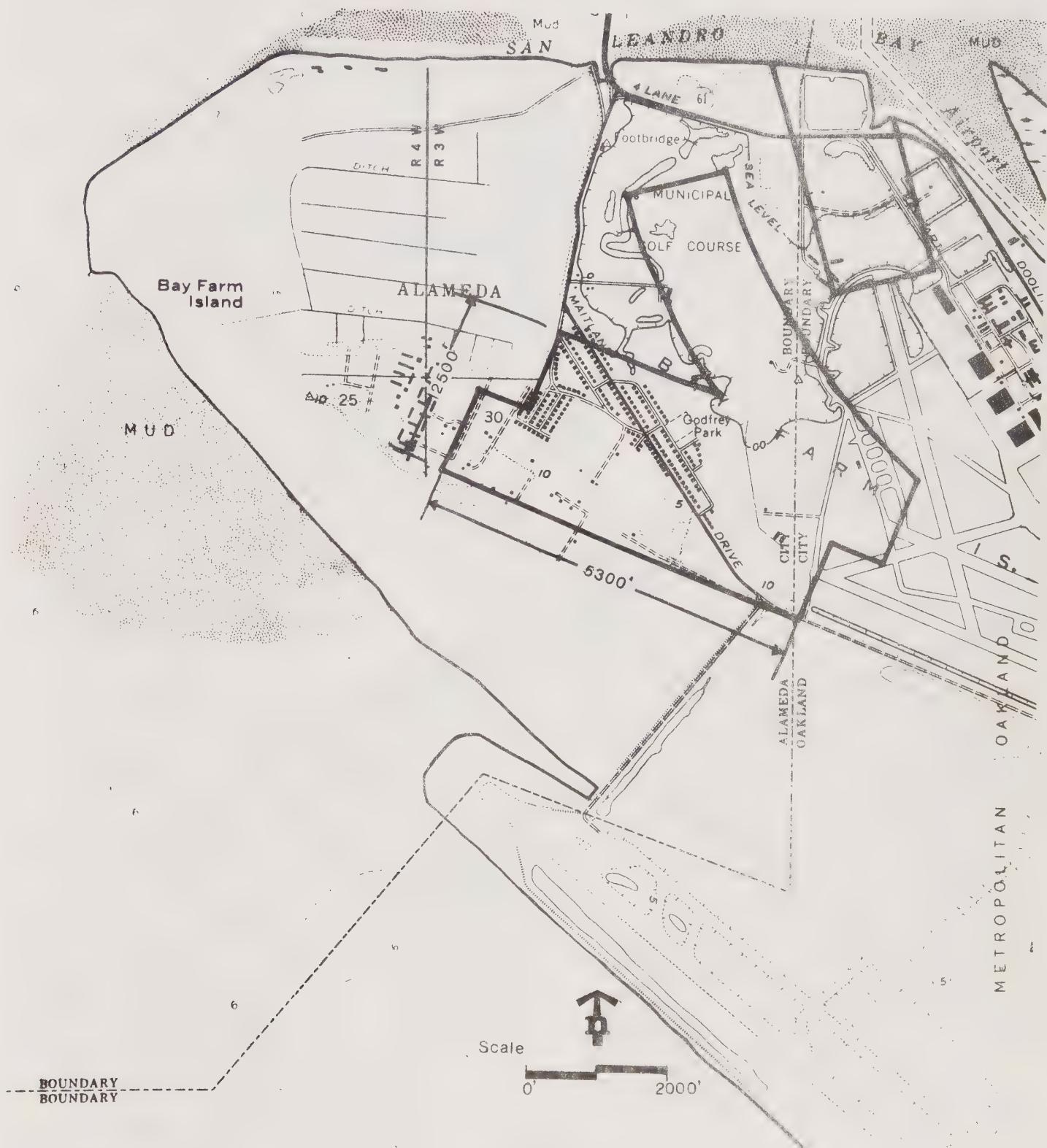
Map III

MOIA And Hayward Air Terminal General Referral Area



Map IV

Bay Farm Island Safety Zones



Map V

San Leandro **Safety Zone**



MAP VI
MOIA NOISE IMPACT ZONE
BAY FARM ISLAND



Developed Areas: 1977

Source for 60, 70, and 75 dB lines: City of Alameda Noise Element, 1976, page 25

Source for 65 dB line: Settlement Agreement, July 1976

MAP VII
MOIA NOISE IMPACT ZONE
FOR SAN LEANDRO AND HAYWARD



Source: MOIA Draft Master Plan, 1977; Noise Contours for 4 Map

1977

B. HAYWARD AIR TERMINAL

Height Restriction Area

Map VIII shows the areas surrounding Hayward Air Terminal subject to the Federal Aviation Regulations Part 77 height restrictions. Within the Hayward jurisdiction height limits are currently enforced by an "Airport Approach Zoning Plan."¹ Additionally, the City holds a perpetual air aviation easement over commercial land immediately southeast of runway 10R/28L at the Winton-Hesperian intersection. Lands outside Hayward city limits are under County jurisdiction. It is proposed that the County adopt height restriction zoning for enforcement of FAR Part 77 limits.

General Referral Area

Because of the proximity of the Hayward and Oakland airports their referral areas have been combined (Map III). All proposed projects within the general referral area boundaries which may be inconsistent with the Policy Plan should be submitted to the ALUC for review.

Safety Zones

The proposed Air Terminal safety zones depicted on Map IX have been determined on the basis of types of forecast aircraft operations and most frequently-used flight tracks. Because of the forecast increase² of flights by jets and aircraft over 12,500 pounds, safety zones of 5300 feet length, rather than 3500 feet are preferable. However, relatively extensive development beyond 3500 feet from the runways renders the distinction moot. Only the zone based on a left turn after take-off from 10R/28L has extensive undeveloped land beyond 3500 feet.

Airport Land Use Commission policies for uses within these zones recommend that land be kept clear within one-quarter mile of the end of the runway and that new uses in the outer three-quarters of a mile be low density, non-residential.

Lands within one-quarter mile of the north ends of the runways are primarily either within airport bounds or part of the Skywest golf course. Following the flight track that uses a left turn after take-off from 10R/28L, land use in the outlying portions of the corresponding safety zone is a mixture of residential, open space (golf course), and undeveloped land. The latter is planned to form part of an industrial corridor/expressway.³ At the southern ends of the runways, the inner portion of the safety zone - approximately 1000 feet - falls within the Air Terminal, but immediately beyond the airport commercial development and close to 60 acres of residences, some of them mobile homes, are affected. In summary, with the exception of a few scattered vacant parcels and a proposed industrial/expressway area northwest of runway 10R/28L, the land within the proposed safety zones has already been developed.

¹City of Hayward Ordinance 64-038, September 15, 1964.

²Bolt, Baranek and Newman, Noise Contours for the Hayward Air Terminal (to 1990).

³This land is partly within Hayward, partly unincorporated. However, both the Hayward and County general plans recognize this use.

The Air Terminal has established clear zones approved by the FAA: beyond runway 10L/28R--a trapazoidal zone beginning 200 feet from the runway threshold, 250 x 450 x 1000 feet; beyond runway 10R/28L--a zone 500 x 900 x 2000 feet. In accordance with FAA instructions that the area be free of obstructions to air navigation, the Air Terminal clear zones off the northern ends of the runways fall on undeveloped airport land and the Skywest golf course. To the south the clear zone for 10L/28R falls within the airport, but for the 10R/28L runway the clear zone takes in residences, the Winton-Hesperian intersection, and commercial buildings; the Air Terminal holds an air avigation easement over the latter.

Noise Impact Zone

Map X depicts the noise levels projected for Hayward Air Terminal operations in 1990. The ALUC will use these contours for evaluation of noise/land use compatibility and sound insulation requirements. Thus, the 60 dB CNEL contour marks the outer boundary of the noise impact zone. This noise information, prepared in 1974, assumes 550,000 annual operations--that is, over 1500 daily operations, ten of them by jet aircraft. These contours do not assume retrofitting of existing jet aircraft or replacement of existing aircraft with quieter models.

Contours computed for 1973 operations and generally representative of current noise established that there is no current violation of the California noise standards because no noise-sensitive uses are subject to 70+ dB CNEL, the criterion level for a general aviation airport until 1986. By contrast, the 1990 contours foresee a noise problem: under specified operating conditions and traffic volume, there will be residences within the lower criterion CNEL of 65 dB.

Guided by this forecast and knowledge of the types of aircraft and operations most responsible for noise impact, the airport can seek to abate this noise. Consequently, given possible abatement and assumptions representing jet noise under "pessimistic" conditions (i.e., no retrofit or new technology), these projected contours may overstate long-range future noise.

The 1990 projections reflect flight paths currently used at the airport: straight-in landings by most aircraft, including jets; take-offs from runway 10R/28L with a left turn towards the Bay; take-offs from 10L/28R with a right turn. Northwest

of the Air Terminal the forecast 60 CNEL fans out to affect major areas of unincorporated, residential San Lorenzo Village and undeveloped land near the Bay; the 65+ dB CNEL would affect over 40 acres of existing residences, 15 acres of undeveloped land, and portions of the Skywest golf course. Approximately ten acres of homes would fall within the 70 dB CNEL.

The degree to which the noise in the 65 dB CNEL range would be noticed would depend in part on the ambient noise level. Although it is likely that in the San Lorenzo area ambient noise levels are typical for "urban residential" neighborhoods--possibly in the 50-60 dB CNEL range--ambient noise should be documented more carefully by Alameda County in conjunction with ALUC staff before application of any ALUC land use policies. That flights of jets and heavier aircraft are much more bothersome than light propeller-driven aircraft is evidenced by Air Terminal complaint records. Among the abatement procedures applied to these noisier aircraft operations have been night noise limits and the left turn upon take-off from 10R/28L.¹

At the southeastern end of the airport the projected noise impact area is confined to a slightly smaller area, almost entirely developed. Approximately 100 residentially-developed acres and two schools fall within the 60 dB CNEL; 35 acres of homes are within 65 CNEL. Other areas affected are commercial. Unlike the take-off end, the 70 CNEL falls mostly on airport land.

The effective impact of aircraft noise on population southeast of the airport is reduced somewhat by the high ambient noise levels near Hesperian Boulevard and Winton Avenue. In the vicinity of these roads the noise may exceed 65 CNEL. A block or more from these streets aircraft noise may be more intrusive. It is noteworthy that all of the Hayward Mobile Estates, roughly four dozen mobile homes, would be within a 60-70 dB CNEL; mobile homes cannot be as effectively sound insulated as homes of conventional construction.

Background Information: Hayward Air Terminal

The municipally-owned Hayward Air Terminal is the busiest general aviation facility in the region. Centrally located in the populous corridor of communities along the eastern edge of San Francisco Bay, the Terminal is approximately six miles south of the Oakland North Airport--five miles from South Airport runway 29--and 16 miles north of the smaller, privately-owned Fremont airport. Because of proximity to the Oakland Airport, the airspace capacity and types of operations for the Air Terminal are affected by those at Oakland.

The Air Terminal has two parallel runways: 10L/28R (3543 feet in length) and 10R/28L (5156 feet). The Hayward Air Terminal has a control tower and non-precision approach on runway 28. Capacity is estimated to be 600,000 annual operations and 800-1000 based aircraft, compared with a 1974 total of 320,000 operations and 470 based aircraft. It is expected that the future fleet will change slightly in composition, with a modest increase in jet use.

Of the three public general aviation airports in Alameda County, the Hayward facility is most hemmed in by existing urban development, particularly at both ends of the runways. As a result, there is a greater possibility that surrounding land uses will constrain future operations. This is reflected to some degree in the airport plan, as there is no intention to make any major expansions

¹The City of Hayward has imposed a curfew setting maximum allowable aircraft noise at 75 dB between 11 p.m. and 7 a.m.

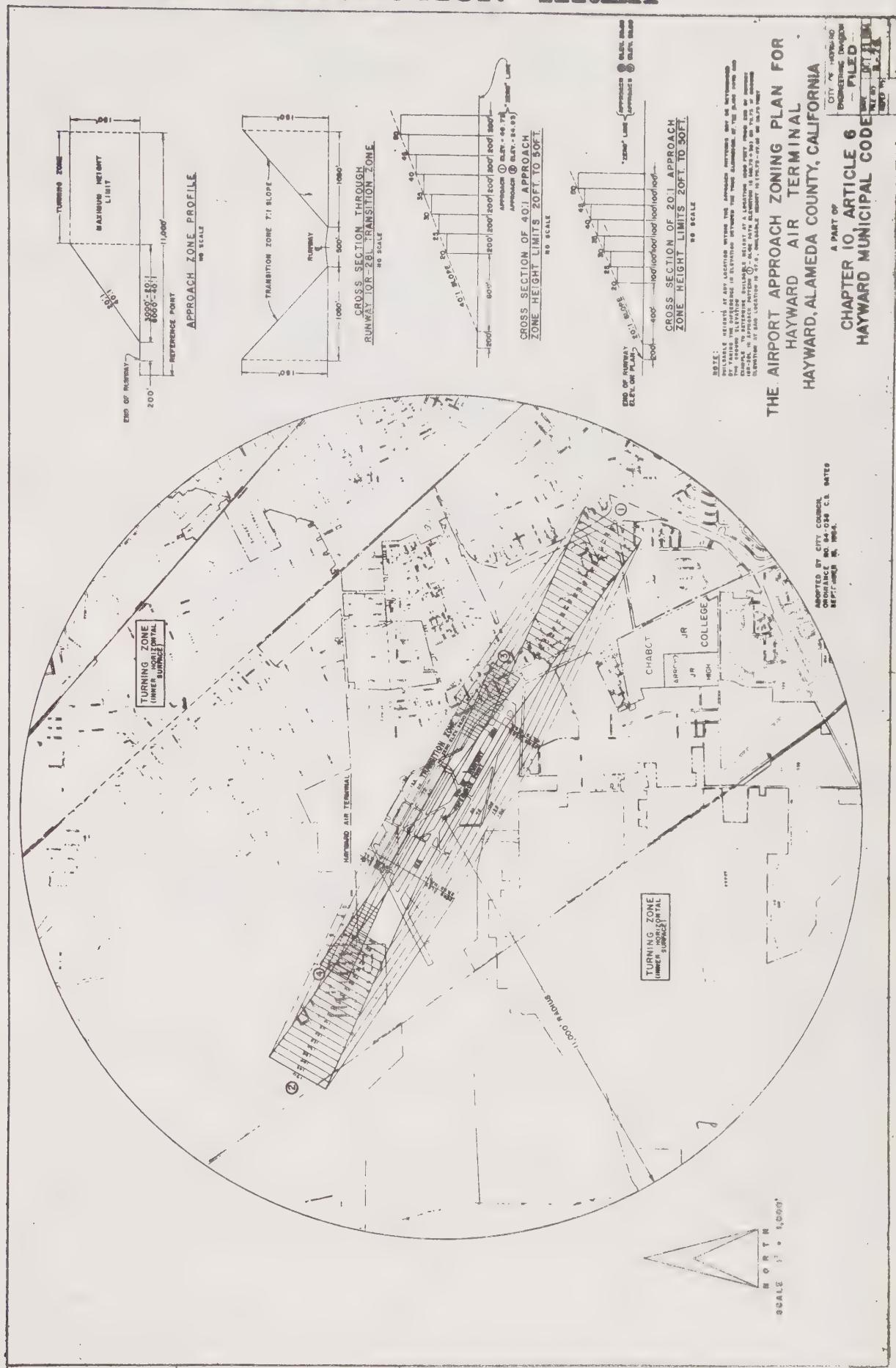
of facilities.¹ The City is, however, encouraging industry and airport-related activities immediately west of the airport and commercial/industrial along Winton Avenue and Hesperian Boulevard. Development of a road running east-west on the north edge of the airport is also contemplated.

The National Guard currently occupies facilities at the Air Terminal but intends to move out its operations after 1977. Future use of the site has not been determined. As described in the sections on noise and safety impacts, the City of Hayward has made some efforts to adjust land use to airport operations, has studied potential future airport impacts, and on occasion has instituted noise abatement procedures. The City General Plan noise element deals with airport-generated noise, but the safety element does not discuss the airport area. The fact that most of the areas directly north of the Air Terminal lie outside Hayward city limits complicates coordination of standards and policies for airport impact and land use.

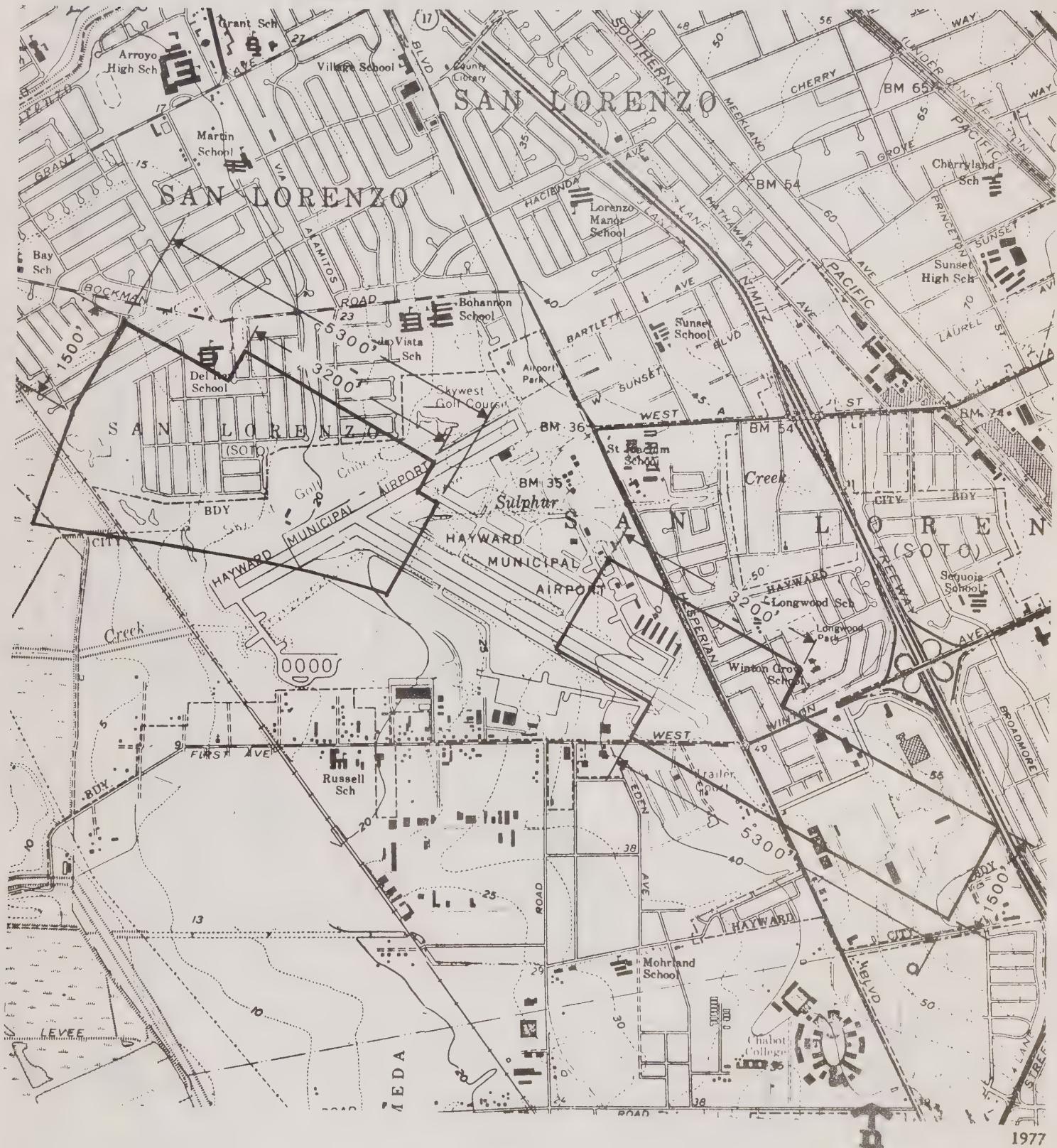
¹ALUC Resolution 3, September 15, 1971.

MAP VIII

HAYWARD HEIGHT AIR TERMINAL RESTRICTION AREA



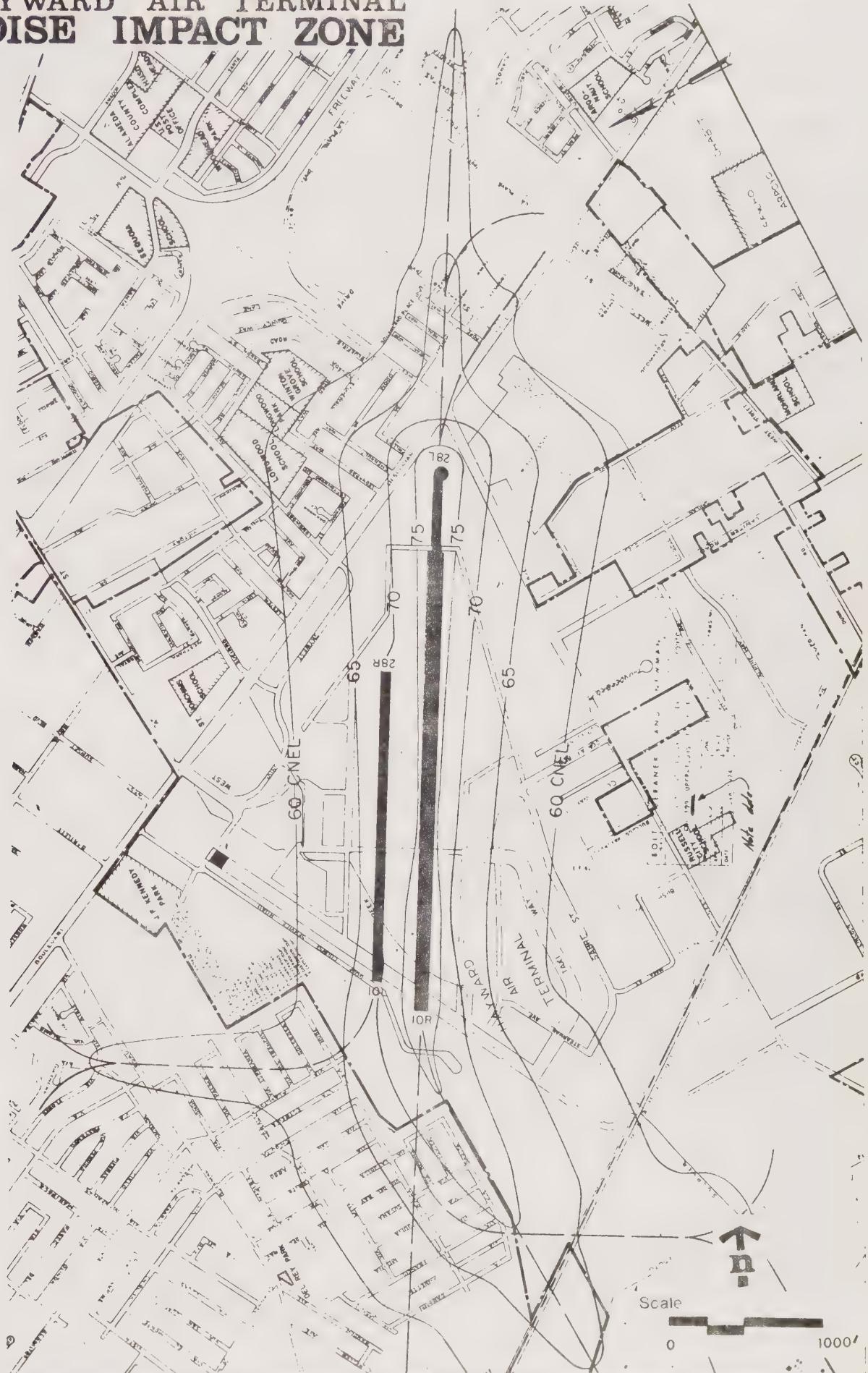
MAP IX
**HAYWARD AIR TERMINAL
SAFETY ZONES**



scale: 0' 1000' 2000'

HAYWARD AIR TERMINAL NOISE IMPACT ZONE

MAP X



Source: Noise Contour Forecast prepared for the City of Hayward by Bolt, Baranek and Newman, 1974

(Contours forecast to 1990)

C. LIVERMORE MUNICIPAL AIRPORT

Height Restriction Area

Map XI shows the FAR Part 77 surfaces for Livermore Municipal Airport. It is recommended that the affected jurisdictions - Livermore, Pleasanton and Alameda County - adopt height restriction zoning to enforce FAR Part 77.

General Referral Area

Map XII shows the proposed general referral area around the Livermore Airport. This area corresponds to the plan area adopted by the ALUC in 1971.¹ The potential inclusion of a hill area on the northeast is recommended by the Airport Master Plan:

The implementation of an instrument landing system (ILS) will lower the approach surface for Runway 25 from the present 34:1 to 50:1. Calculations show that the hill to the east of North Livermore Avenue and south of Interstate 580, will be only about 12 feet below the 50:1 surface. While the area is now outside the ALUC Planning Area, it is recommended that the City carefully review any proposals for development in this area, based on the height limiting zoning ordinance, and provide zoning which is appropriate. It is also recommended that the area be included within the ALUC Planning Area, for review of development based on the same ordinance.²

Safety Zones

Map XIII depicts Livermore Airport safety zones, measured from the end of the proposed runway extension on the premise that the possibility of increased use of heavier aircraft and jets justifies the longer zone area. Should the City policy toward these aircraft change or a decision be made not to extend the runway, the length and placement of the western zone should be adjusted.

The ALUC safety zones encompass airport approach areas and clear zones in the Master Plan but are not intended to supplant or conflict with them in any way. ALUC evaluation of new projects in the proposed approach areas and clear zones should seek to ensure compatibility of the project with airport operations and the Master Plan: land uses proposed within an "approach area" not yet purchased by the airport would be evaluated by approach area standards. ALUC jurisdiction would apply until the land is acquired by the airport. Lands falling outside approach areas and clear zones but within ALUC safety zones will be evaluated by the ALUC policies set forth in Chapter II.

¹ALUC Resolution 3, September 15, 1971.

²Livermore Airport Master Plan, p. 107.

Noise impact zone

Map XIV delineates the noise impact zone, defined by the 60 CNEL forecast to 1995.¹ For proposed projects within these areas the ALUC land use/noise compatibility and sound insulation standards will apply.

As part of the airport Master Plan, the City of Livermore is considering adoption of sound insulation and noise/land use compatibility standards parallel to those of the ALUC Plan. These standards, applicable only to the airport plan area within Livermore city limits, set 60-65 CNEL as an "allowable" range for new residences, schools, and health-related institutions, providing sealed windows and forced air ventilation are included. However, outdoor activity may be interrupted. New noise-sensitive uses are prohibited in areas forecast for 65+ CNEL, almost all of which would come within the proposed approach area.

To the west the noise impact zone falls on undeveloped land. In the long run most of this land is marked for inclusion in the airport approach area.

Background Information: Livermore Municipal Airport

The Livermore Municipal Airport is one of three major general aviation airports in Alameda County. Located in the Livermore-Amador Valley, approximately 15 miles east of the major Bay Area urban development, the airport has within the past two decades experienced an expansion of activity paralleling the population growth of its suburban surroundings: records of based aircraft show an increase from 104 in 1966 to 219 in 1974.²

The airport has been at its present site three miles west of central Livermore since 1965, having been pressured at a previous location by urban encroachment. Although the airport is within Livermore boundaries, most lands on the south, west and north are unincorporated. Pleasanton city limits begin approximately 1.2 miles west of the airport.

The airport service area is defined in the Master Plan as the area for which the Livermore Airport is the closest general aviation facility. Geographically this takes in the two-county Livermore-Amador and San Ramon valleys, which had a combined 1974 population of 128,000. This functional service area definition is supported by the fact that in 1974, 77% of based-aircraft owners lived within this range; another 15% lived in the East Bay.³ The closest comparable airports are Hayward Air Terminal, roughly 16 miles to the west and Tracy Municipal Airport, 20 miles east.⁴

Although the airport is classified by the FAA as a "general transport" facility, the Master Plan characterizes it as "physically and operationally a basic transport airport," which means it can accommodate turbojets under 60,000 pounds and general aviation aircraft of lesser weight and speed. Among the 219 based aircraft in 1974, only 12 were twin engine and, of these, only one turbine-powered. The single 4000 foot runway handled 165,641 operations in 1974 and has an estimated capacity of 235,000 annual operations, which can be boosted to approximately 255,000 with taxiway improvements.

¹Livermore Airport Master Plan; Environmental Impact Assessment, adopted 1977.

²Livermore Airport Master Plan, p. 46

³Ibid., p. 34

⁴The Livermore Airport Master Plan observes:

"A master plan has just been completed for Tracy Municipal Airport recommending that the facility remain a general aviation airport with minimum expansion and development. The master plan stated that future development of Tracy Municipal Airport is dependent upon the recommendations of the Livermore Municipal Airport Master Plan", p. 31.

Airport Master Plan

An airport Master Plan (1975-1995) has recently been adopted by the City of Livermore. The document actually contains two components: first, a projection of future airport use and plan for facility development in the event of increased activity; second, a survey of land use within the ALUC-adopted plan area and recommendations for maintaining nearby uses compatible with airport operations.

1. Airport Plan

At a future service area population of 245,000 (approximately 78,000 households), the airport is forecast to have approximately 500 based aircraft and 340,000 annual operations. Although the Master Plan refers to these figures as a 20 year forecast, growth may not occur at this rate. The effect of the general plans dealing with the Livermore-Amador Valley (i.e., Alameda County, Livermore, and Pleasanton plans) or plans for the San Ramon Valley in Contra Costa County may be to bring about growth at a rate other than that presumed in the airport Master Plan.¹

As recognized in the Master Plan, this would alter timing but not recommended sequence of airport development: the Master Plan does not propose airport development in anticipation of demand.

The following are important aspects of airport planning:

- * The airport would remain a basis transport facility.
- * Within the next five years clear zone and approach area acquisition should be carried out.
- * At the level of approximately 235,000 annual operations, taxiway improvements would be required to accommodate increased use of runway 7/25.
- * Above 255,000 annual operations a second, 2700-foot runway would be built, expanding capacity to 385,000 operations.
- * A 1250-foot expansion of runway 7/25 (now 4000 feet in length) is contemplated for the longer range (15-20 years) if jet operations increase.

2. Noise Impact

Currently noise above 60 dB CNEL affects areas within approximately 2000 feet of the runway; beyond airport grounds the uses are golf course, sewage treatment plant, and "agricultural" open space. Projected contours show a marked increase in the area affected by 60+ dB CNEL, including existing residences in Livermore. Although the 65 CNEL, is not predicted to fall on any existing noise-sensitive uses, and the Master Plan calls for review of operations to prevent exceeding projected noise levels, it should be recalled that the CNEL is in fact a band, the "line" having a range of as much as 3 dB. Thus, while the airport might not be in violation of California noise standards,² the noise level over residences might prove objectionable.

The Master Plan observes that projected increase in business and corporate jets is responsible for noise impact at greater distances from the airport; it is estimated that there will be approximately 10 jet aircraft based at the airport in 1995, and 3400-6800 annual turbine aircraft operations.³

¹To date, Livermore has adopted a growth policy which would lead to a city population below that presumed in the airport plan; Alameda County is reviewing its Livermore-Amador Valley Plan.

²California Administrative Code, Sections 5000 ff. After 1985, an annual CNEL of 65 or higher will violate the standards if it takes in schools or most residential uses.

³Master Plan, p. 81.

3. Safety impact

The Master Plan delineates expanded clear zones and approach areas for the airport, assuming addition of a basic utility runway and extension of the existing runway. Dimensions for these areas, which are recommended for purchase by the City, are in accordance with FAA guidelines for non-precision instrument runways.¹ The proposed western clear zone and approach area are measured from the end of a proposed extension of the existing runway, although such an extension is premised on increased jet traffic. Without the 1250 foot runway extension, the distance from the end of the present runway to the outer edge of the proposed western approach is almost 4900 feet.

Purchasing these lands will depend not only on municipal finances but FAA funding. The City already owns the existing east clear zone and that portion of the western zone within the golf course; beyond this point the City holds an easement in the existing western clear zone. An application for funds to purchase over 100 acres in the western approach area is under consideration by the FAA. It is noteworthy that the western area past the golf course lies outside both City limits and the Livermore sphere of influence as defined by the Local Agency Formation Commission (LAFC).

If incorporated into the airport, these approach areas and clear zones, now primarily under open space, would be subject to FAA use standards: the clear zone is to be kept free of all structures and maintained "to ensure the safe and unrestricted passage of aircraft in and over the area."²

The Master Plan notes:

Acquisition of clear zone land is mandatory for the safe and efficient operation of the airport, and necessary to comply for the receipt of future federal matching funds for projects.

Approach areas are a recommended purchase for positive control of compatible land development within the airport approach environs; at the minimum, all lands falling within the 65 CNEL contour should be acquired. Recommended land use within the approach areas but outside of clear zones, include agriculture, park and open space, light industry (warehousing, etc.) and roadside commercial, given that there are no buildings penetrating the approach surface or areas where there is a dense population.³

The clear zone and approach area land use standards are generally equivalent to the safety zone policies proposed in this ALUC Plan. ALUC land use policies recommend that land remain clear within one-quarter mile of the runway; beyond this distance uses should be low density, non-residential.

Determination of the safety zone dimensions is a function of the type of aircraft operations, currently primarily single engine-propeller driven aircraft. For a single runway used by propeller aircraft under 12,500 pounds recommended ALUC zone dimensions are: 1500 feet wide and 3500 feet long - similar to the Master Plan proposals. If the airport contemplates handling a "significant" number heavier of aircraft and jets which use straight-in landings and departures

¹FAA Airport Development Aid Program (ADAP) guidelines specify dimensions up to 1500 feet wide and 3400 feet long for a nonprecision instrument runway; for airports serving turbojets the dimensions may be 2500 feet wide and 5000 feet long.

²FAA, FAR, Part 152

³Master Plan, p. 106.

and which are likely to cause greater damage in the event of an accident over a developed area, a safety zone length of 5300 feet is recommended. In the case of the Livermore airport, application of the latter zone would be preferable because of the possibility of increased traffic of heavier aircraft and jets.

With a safety zone length of 5,300 feet, currently all "safety zone" land past the golf course west of the airport is in an "agricultural" unincorporated area. East of the airport lies a sewage treatment plant and unbuilt land designated as open space in the Livermore General Plan. Beyond this land, almost 60 acres of a residential subdivision fall within 5300 feet of the end of runway 7/25.

MAP XI
LIVERMORE MUNICIPAL AIRPORT
HEIGHT RESTRICTION AREA

HIGHWAY 28 PROFILE

HIGHWAY 71 PROFILE

TRANSITION ZONE

TRANSITION ZONE

10,000'

NOTE: NO HEIGHT LIMITING ZONE EXISTING OR APPROVED
AT LIVERMORE MUNICIPAL AIRPORT

LIVERMORE MUNICIPAL AIRPORT

LIVERMORE, CALIFORNIA

APRIL 1ST, 1970

SECTION W CONSTRUCTION & ASSOCIATES

10

APRIL 1ST, 1970

SECTION W CONSTRUCTION & ASSOCIATES

10

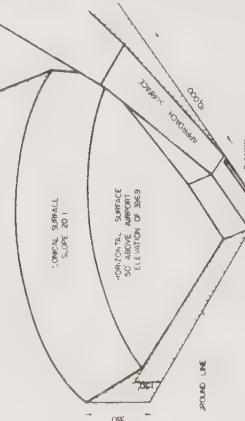


TRANSITION ZONE

TRANSITION ZONE

TRANSITION ZONE

ISOMETRIC

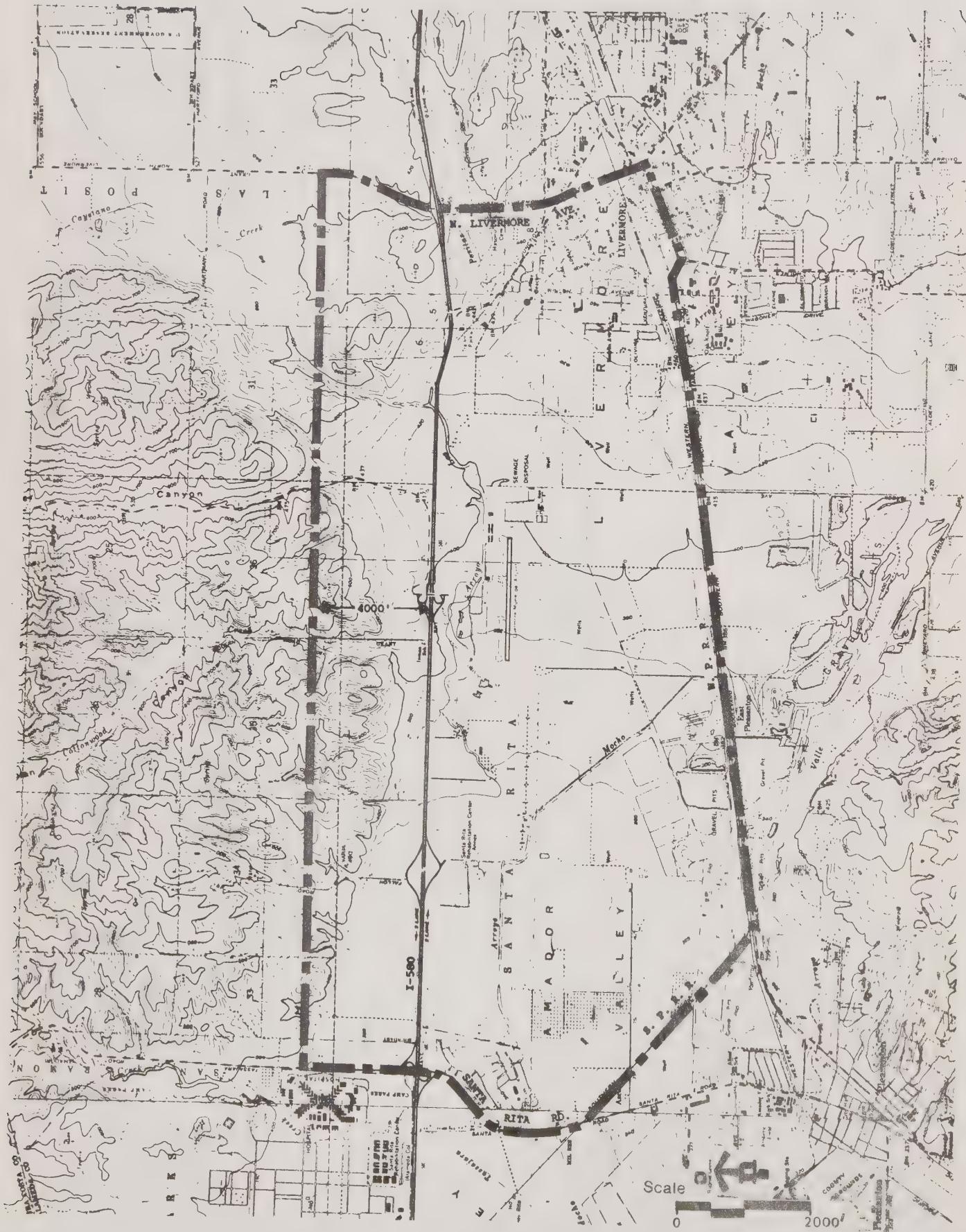


NOT TO SCALE
SECTION A-A

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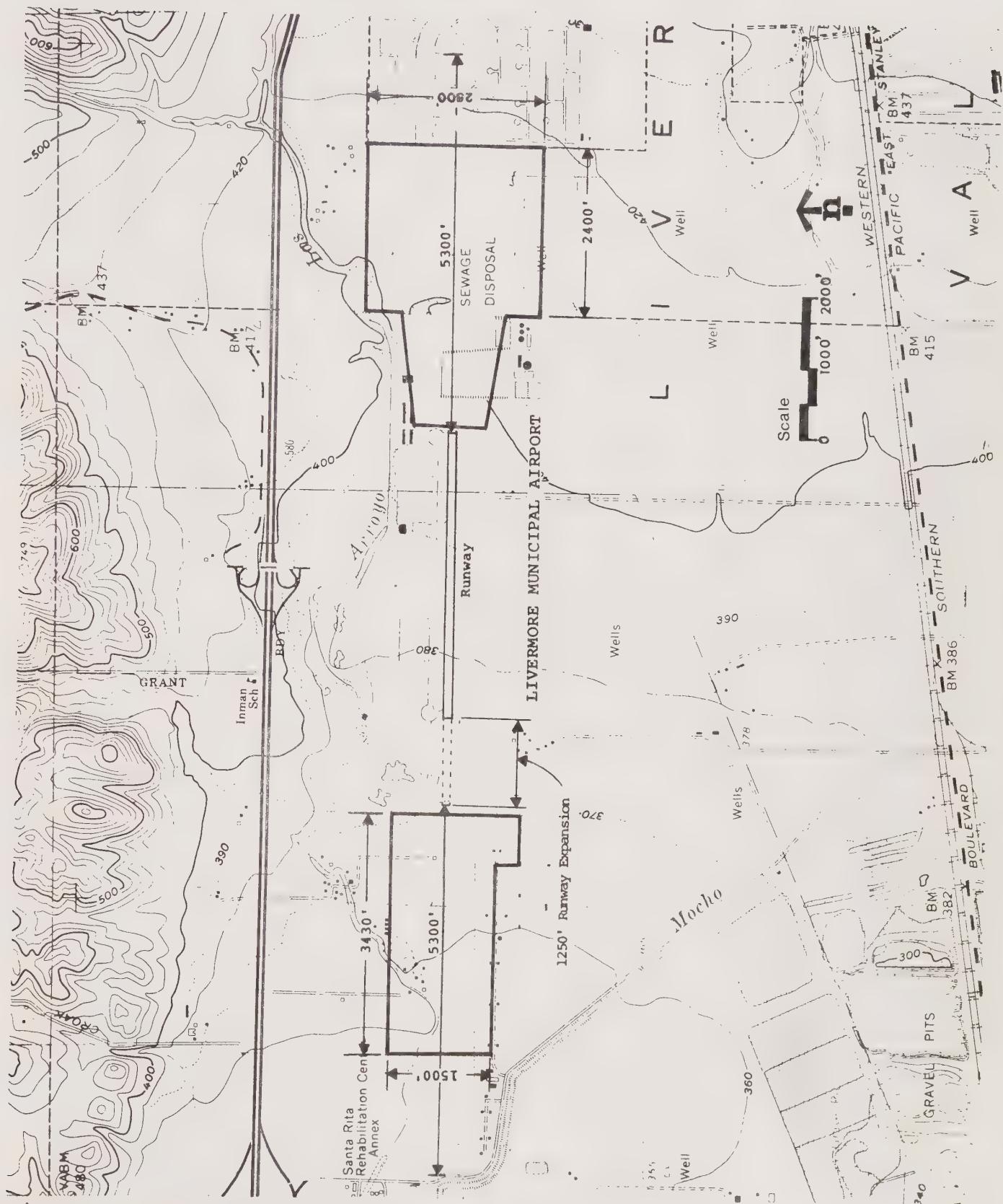
MAP XIII

LIVERMORE MUNICIPAL AIRPORT GENERAL REFERRAL AREA



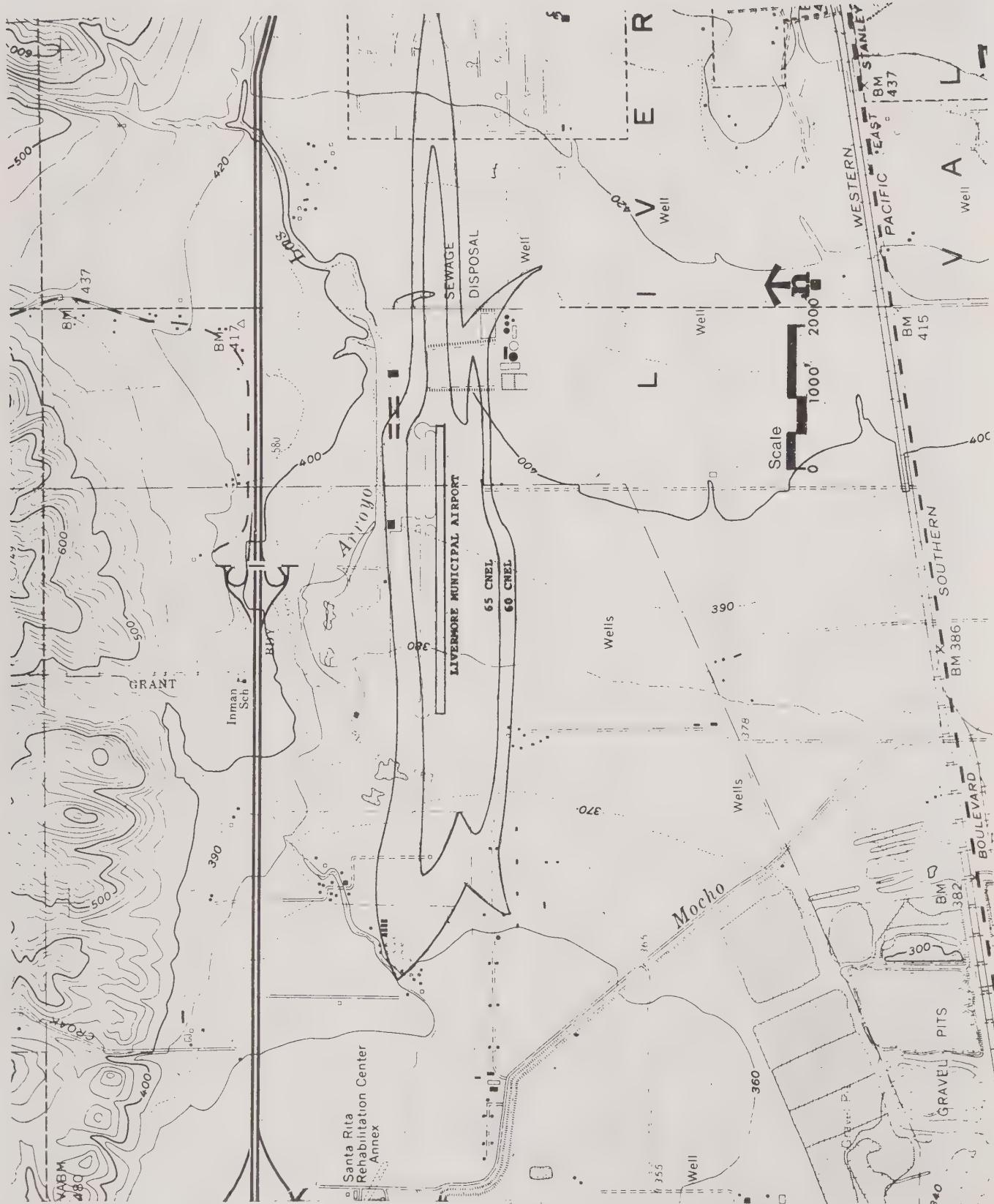
MAP XIII

LIVERMORE MUNICIPAL AIRPORT SAFETY ZONES



Based on clear zones and approach areas in the
Livermore Municipal Airport Master Plan, 1975.

MAP XIV
**LIVERMORE MUNICIPAL AIRPORT
NOISE IMPACT ZONE**



Source: Livermore Municipal Airport Master Plan, 1975.
(Contours Forecast to 1995) 41

1977

IV. BACKGROUND INFORMATION

A. SAFETY

Through controls over air operation procedures, aircraft technology, and hazardous land uses, an effort can be made to "minimize" the likelihood of an accident. These precautions, however, cannot guarantee absolute safety. For this reason, measures should be taken to adjust both air operation and land uses in the vicinity of the airport to limit crash hazards to an acceptable level of risk. The Airport Land Use Commission has the responsibility of adopting policies for new land uses so as to protect the safety both of people in the airport area and air navigation. These policies are designed to prevent development of land use-related hazards to air navigation and to limit the risk of casualties on the ground in the event of a crash.

There are several studies of civil air crashes which provide useful information on factors involved in accidents.¹ Although civil air accidents near airports occur infrequently (approximately 1.38 per million air operations),² their location shows a pattern which can be related to the problems of human and mechanical stress and land use interference encountered in aircraft take-offs and landings. Roughly half of all accidents occur on airport property and another 13% occur within one mile of the airport (primarily within the first quarter mile).³ These patterns provide a strong basis for the definition of ground safety zones.

A study of civil air accidents nationwide found that:⁴

- * 39.1% of the accidents reported were the result of "engine failure" (mechanical or pilot error). This more typically a problem for piston than for turbine engine aircraft.
- * 20.2% resulted from "loss of control or inability to climb at too slow a speed."
- * 5.8% collided with trees. (It will be assumed that any object of comparable height would constitute a similar obstacle).
- * 9.7% of accidents were the result of "short landing," for large jet aircraft often the cause of a serious crash.

A distinction should be made between the flight performance and crash hazards presented by light aircraft and larger, typically jet, aircraft. While the number of light aircraft accidents is greater--primarily due to the higher volume of flights--the crash impact of the heavier, faster jet is much more severe than that of the small piston engine airplane. For piston engine and jet aircraft the take-off is the time of greatest mechanical stress. However, in the event of engine failure, lighter piston engine aircraft are often maneuverable enough to be guided for an emergency landing, whereas, heavier aircraft and jets lack this maneuverability.⁵

¹ Testimony from the Proceedings of the Hearing on Land Use Planning in the Vicinity of Urban Airports, California Legislature, Assembly Committee on Natural Resources and Conservation, Edwin L. Z'Berg, Chairman, January 1973 (espec. James McElroy, "Aircraft Accidents in the Vicinity of Airports," p. 10-23); Envicom Corp., Draft Report: Airport Safety, City of Alameda, March 1976.

² McElroy, "Airport Accidents," p. 11. "Near airport" means within one mile.

³ Cf. Envicom Corp., Airport Safety; McElroy, "Airport Accidents."

⁴ McElroy, "Airport Accidents," p. 14-15.

⁵ McElroy suggests that busy general aviation traffic in a built-up urban environment tends to create more hazardous conditions. He observes that for the year 1970 the accident rate was significantly higher at four airports having "urban development surrounding them and very heavy general aviation traffic." This is a subject which should be carefully examined before any major expansion of aviation facilities in developed areas, "Airport Accidents," p. 22.

Among the land uses and development which have been identified as hazards to air navigation are objects exceeding Federal Aviation Regulations Part 77 height standards, uses which attract large concentrations of birds within approach areas, smoke-producing uses, flashing lights, reflective materials, and flammable materials.

Airport Safety Standards and Legislation

In addition to the airport land use commission legislation, directing the commissions to establish height restrictions and other land use standards to protect public safety and air navigation safety, there are state and federal regulations and state enabling legislation pertaining to airport area safety.

1. Height

Federal Aviation Regulations Part 77 ("Objects Affecting Navigable Airspace") sets basic height standards which take precedence over any state height standards. These regulations apply to objects around civil and military airports and heliports, with the standards differing according to the type of air facility and operations there.

Although FAR Part 77 does outline administrative procedures for these standards, their enforcement is weak. The FAA should be notified if a proposed project exceeds the height restriction for that location, and the Administrator may, after study, determine that a proposed construction is hazardous to air navigation. The opinion is only advisory, however. The FAA cannot itself prohibit or restrict construction, although affected local jurisdictions are encouraged to adopt airport hazard zoning.

To strengthen the enforcement of FAR Part 77 it is recommended that all affected zoning jurisdictions adopt height restrictions in conformity with the regulations.

The Federal Aviation Regulations (Part 152.9b) also define clear zones where no development is allowed except that required for airport operations. California Public Utilities Code Sections 21656-7 empower the state Division of Aeronautics to approve or disapprove the erecting of any structure greater than 500 feet high, the PUC Section 21659 prohibits constructing structures hazardous to air navigation (as defined in FAR Part 77) unless allowed by the Division of Aeronautics. In neither case may the Division override an FAA decision.

2. Land Use

The safety element of the general plan for counties and cities (California Government Code Section 65302) may include a section on airport hazards, although few local governments have done so. (The City of Alameda has prepared an airport safety study and recommendations for inclusion in the City General Plan Safety Element). State legislation on "Airport Approaches Zoning" (Government Code Section 50485) permits cities to exercise their various police powers to ensure that necessary space for air navigation is not infringed upon. In addition to zoning, cities and counties may raise and spend public funds to acquire land or property interest to prevent or mitigate airport hazards. To assist cities and counties in land use planning near airports, the FAA has issued a "model airport hazard zoning ordinance."

3. Safety Areas

The areas beyond both ends of a runway for a distance of up to a mile are subject to higher crash risks and can, in their development, pose more hazards to air navigation than other areas. Consequently, safety areas or zones should be established. The FAA suggests maintenance of "approach areas" of length and width proportionate to the type of aircraft using the runway and the type landing approach; financial assistance is offered to airports wishing to purchase land for these approach areas. Other "safety zone" definitions have been put forth, and some implemented, all in relative agreement as to the minimum land area within which development and population concentration should be limited.¹

B. NOISE

State of California Airport Noise Standards

State law empowers the Division of Aeronautics to adopt and enforce standards regulating the community noise impact near public airports. The standards as set out in Administrative Code Section 5000 et seq are included in the Appendix to this Policy Plan. Their effect on land use is summarized here.

The community noise equivalent level (CNEL) has been established as the noise rating scale for California airports operating under a permit from the State Division of Aeronautics. This is an average sound level during a 24-hour day, obtained after adding 5 decibels (dB) and 10 dB respectively, to sound levels in the evening (7 p.m. - 10 p.m.) and in the night (10 p.m. - 7 a.m.). In the interests of reducing or avoiding problems of interference with sleep, speech, and general annoyance caused by high noise levels, the regulations have set 65 dB CNEL as "the level of noise acceptable to a reasonable person residing in the vicinity of an airport."² Acknowledging variations in individual reactions to noise and other sources of imprecision in the CNEL measure, the regulations also call for periodic review of the criterion level.

By 1986, 65 dB CNEL will serve as the "criterion" noise level in determining if residential areas are being subjected to excessive airport noise. Prior to 1986 the following "criterion noise levels" are to be used to define excessive airport noise in residential areas:³

5012. Airport Noise Criteria. Limitations on airport noise in residential communities are hereby established.

- (a) The criterion community noise equivalent level (CNEL) is 65 dB for proposed new airports and for vacated military airports being converted to civilian use.
- (b) Giving due consideration to economic and technological feasibility, the criterion community noise equivalent level (CNEL) for existing civilian airports (except as follows) is 70 dB until December 31, 1985, and 65 dB thereafter.

¹ ALUC, "Background Report on Safety."

² California Administrative Code Section 5005.

³ California Administrative Code Section 5012.

(c) The criterion CNEL for airports which have 4-engine turbojet or turbofan air carrier aircraft operations and at least 25,000 annual air carrier operations (takeoffs plus landings) is as follows:

Date	CNEL in Decibels
Effective date of regulations	
to 12/31/75	80
1/1/76 to 12/31/80	75
1/1/81 to 12/31/85	70
1/1/86 and thereafter	65

The regulations proceed to classify land uses according to compatibility with noise exceeding the criterion level. Noting that the criterion level pertains to "urban residential areas where houses are of typical California construction and may have windows partially open",¹ it is judged that single family and multi-family dwellings, trailer parks, and schools of standard construction are incompatible. High rise apartments are acceptable if designed with central air conditioning and noise insulation to limit the interior CNEL to a maximum 45 dB during aircraft operations. The state regulations also provide in Section 5014 that land uses will be considered compatible if the property is subject to an avigation easement for noise.

The area of land devoted to existing incompatible uses is termed the "noise impact area." In their discussion of methods to control and reduce noise problems, the regulations cite measures to be taken by both the airport and jurisdictions affecting adjacent lands. The regulations specify that "Preference shall be given to actions which reduce the impact of airport noise on existing communities. Land use conversion involving existing residential communities shall normally be considered the least desirable action for achieving compliance with these regulations."² Provisions are made for noise-affected existing homes around existing airports: the acceptable CNEL may be increased as much as 15 dB if the homes have been acoustically treated to reduce interior noise to the acceptable level.³ However, such a solution does not ameliorate the impact of noise on outdoor activities. An airport unable to meet the state standards may be granted a temporary variance by the Division of Aeronautics provided the Division is satisfied that it would be in the public interest to do so and that the airport proprietor is genuinely seeking to apply noise abatement and mitigation measures (Section 5075).

Residential Noise Insulation Standards

The state noise insulation standards are designed to achieve an interior CNEL level (due to exterior sources) of not greater than 45 dB in new hotels, motels, apartment houses, and dwellings other than single family detached dwellings. Local jurisdictions are required to adopt in their building codes noise insulation standards at least as stringent as those set by the state.⁴ In the case of airport noise, new "residential buildings or structures to be located within an annual CNEL contour . . . of 60 require an acoustical analysis showing that the structure has been designed to limit intruding noise to the prescribed allowable levels (45 dB CNEL). CNEL's shall be as determined by the local jurisdiction in accordance with its general plan."⁵

¹California Administrative Code, Section 5005.

²California Administrative Code, Section 5011.

³It is assumed in the regulations that normal residential construction will afford a 20 dB reduction of exterior to interior noise.

⁴California Health and Safety Code, Section 17922.6.

⁵California Health and Safety Code, Section 17922.7.

Several aspects of these standards and the noise measurement's involved in their implementation should be noted. First, the annual CNEL contours called for are a measure of overall noise--even those contours, taken near airports, which are primarily attributable to aircraft noise. Given this, and the stipulation that the CNEL's be in accordance with the local general plan, it is conceivable that the airport-related noise contours recognized by a community in its implementation of the noise insulation standards might not be the same as those contours recognized by the Division of Aeronautics for its airport noise standards. Secondly, although a community may expand the scope of its noise insulation standards, few have done so,¹ depending instead on the model of the State noise insulation standards, which refer only to certain new residential uses and leave new non-residential development, single-family residences, and existing development unaffected. Finally, the fact that the standards require noise reduction to a 45 CNEL does not mean that individual noise events will necessarily be reduced to a maximum 45 dB. This is a significant matter when the primary CNEL noise source is intermittent aircraft noise. As an example, a 65 CNEL near an airport may be primarily attributable to 50 overflights averaging 83 dB each. In a home designed for a 20 dB reduction (65 CNEL lowered to 45 CNEL), a single overflight will exceed 60 dB. To deal with single event noise impact and the effects of noise on uses not covered by existing insulation standards, Tables IV-VIII have been included for information in Appendix G.

City and County General Plans

By state law a noise element must be included in the general plan of each city or county. A relatively recent addition to the list of mandatory general plan elements,² the noise element should offer a comprehensive look at the noise environment of an area and the impact of that noise on the full spectrum of land uses in a community. This is in contrast to the airport noise standards, which focus on the impact of airport noise on certain existing and planned residential uses, and the noise insulation standards, which bring to bear measurement of overall CNEL on certain new residential uses.³

Because the mandatory and optional contents of the general plan noise element were changed by law as of January 1, 1976, the scope of the noise element of a local jurisdiction depends upon the date of its adoption.

Prior to 1976 noise elements were required to include only ground transportation facilities: highways, ground rapid transit systems, and ground facilities associated with airports operated by permit from the state Division of Aeronautics. Noise contours were to be expressed "in any standard acoustical scale" in minimum 5 decibel increments down to 65 dB--or, in the case of hospitals, rest homes, long term medical or mental care and outdoor recreation, down to 45 dB. These pre-1976 noise element requirements made no mention of the Division of Aeronautics-administered airport noise standards (adopted in 1970), nor of the airport land use plans to be developed by airport land use commissions.

¹In Ordinance 1750, the City of Alameda does include detached single family dwellings which are part of a subdivision and lie in a high noise exposure area.

²The noise element is defined in the Government Code Section 65302 (g), 1974. Mandatory contents of the noise element were changed in 1975 by Senate Bill 860 (Beilenson 1975).

³California Administrative Code Sections 5000-5032 (Airport Noise Standards); California Health and Safety Code Sections 17922.6 and 17922.7 (Noise Insulation Standards).

All noise elements, or noise element revisions, adopted after January 1, 1976, must conform to the amendments set down in Senate Bill 860 (Beilenson, 1975). Among the changes and additions are the following:

- Recognition of guidelines for noise elements to be established by the State Office of Noise Control.
- Requirement that the element cover "commercial, general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation.
- Requirement that noise contours be presented in either CNEL or Ldn¹ in 5 dB intervals down to 60 dB. (For noise sensitive areas² the level must be monitored.)
- The adopted noise element is to serve as the guideline for compliance with the state noise insulation standards.

Although the legislation itself makes no reference to the Division of Aeronautics airport noise standards, the Office of Noise Control guidelines recognize the noise measures carried out through the Division of Aeronautics and suggest that this material be incorporated into the noise element.³

Noise/Land Use Compatibility

The Airport Land Use Commission "Land Use Compatibility Table I"⁴ is based on:

- (a) Accumulated case history experiences of noise complaints near civil and military airports.
- (b) Speech interference criteria.
- (c) Subjective judgement tests of noise acceptability and relative "noisiness."
- (d) Need for freedom from noise intrusion.
- (e) Typical noise insulation provided by common types of building construction.
- (f) The judgement of the Environmental Protection Agency (EPA) that "Ldn of 45 dB indoors and of 55 dB outdoors in residential areas are identified as the maximum levels below which no effects on public health and welfare occur due to interference with speech or other activity. These levels would also protect the vast majority of the population under most conditions against annoyance, in the absence of intrusive noises with particularly adverse content."⁵
- (g) The EPA evaluation that Leq (24) \leq 70 dB (or Leq (8) \leq 75 dB) in all areas is necessary to protect the public from hearing loss.⁶

¹Ldn is the average sound level over a 24 hour period, weighted by adding 10 dB to sound levels between 10 p.m. and 7 a.m.

²Noise sensitive areas are defined in the legislation as including, but not limited to, schools, hospitals, rest homes, long term medical or mental care facilities.

³California Office of Noise Control, Guidelines for the Preparation and Content of Noise Elements of the General Plan, February 1976, p. 12. For their part, the Division of Aeronautics airport noise standards make no direct reference to coordination with general plans; adoption of these standards preceded institution of the noise element.

⁴See p. 44.

⁵U.S. Environmental Protection Agency, Information on Levels of Environmental Noise, p. 22. The Ldn measurement is generally equivalent to the CNEL.

⁶Leq(24) is the 24 hour average sound level (not weighted for any hours during this period); Leq(8) is an 8 hour average.

EPA also suggests that, in the absence of findings to the contrary, it is wise to assume that hearing of animals would be similarly affected.

The land use compatibility recommendations presented here reflect the scope of the Airport Land Use Commission's responsibilities and powers defined by state law: that airport impacts on a comprehensive spectrum of land uses be considered, that public welfare be protected. To accomplish this, in certain cases standards more restrictive than the airport noise standards discussed in Policy 11 have been proposed. These standards establish a "caution" CNEL range of 55-65 dB within which proposed noise sensitive uses should be reviewed by the Commission for the protection of public health, safety, and welfare. Several factors contributing to noise impact should be recognized in this evaluation. Because it is intrusive, aircraft noise tends to be more bothersome than continuous noise registering a comparable CNEL. Additionally, certain communities and neighborhoods in the vicinity of airports have a low ambient noise level, making aircraft operations more noticeable. Consequently, the state airport noise standards may not be sufficiently restrictive to protect such areas.

The proposed Airport Land Use Commission Policy Plan standards are highlighted below. These standards would set minimum levels of restrictiveness; local jurisdictions may choose to adopt stricter land use compatibility standards.

- Certain uses are considered "noise sensitive" and should generally be excluded from areas subject to normalized CNEL levels of 65 dB or higher. Examples of noise sensitive uses include, but are not limited to, residences, open air assemblies, and educational, civic, and health-related institutions.
- Proposed noise sensitive uses within a 60-65 dB CNEL should be reviewed carefully for adequate sound insulation.
- Proposed projects which would entail considerable outdoor activity should be reviewed if they lie within areas of 65 dB or higher.
- Care should be taken before subjecting animals to high noise levels. The EPA observes that, although studies of noise impact on animals--particularly wild animals--are few, it seems reasonable to presume that "noise produces the same general types of effects on animals as it does on humans, namely; hearing loss, masking of communications, behavioral, and non-auditory physiological effects."¹ (It has been observed that poultry and mink farms should not locate in noisy environments, as these animals react adversely.) The threshold for hearing damage is approximately Leq (24) > 70 dB (or Leq (8) > 75 dB).

Implementation of land use compatibility standards cannot be expected to eliminate or avoid all airport-related noise problems. In the first place, Commission policies are applicable only to new land uses, although state regulations pertaining to airport noise does seek to reduce noise impact on existing residential areas.² Another limitation is the fact that a decibel contour "line" is imprecise, particularly if it is a projection of annual average CNEL. Air

¹EPA, Information on Levels of Environmental Noise, p. E-4.

²California Administrative Code, Sections 5000-5032.

flight mix and volume, weather conditions, flight paths, and other factors all contribute to ground level noise impact. The State Office of Noise Control points out that in actual noise measurement the greater the distance from the source, the more inaccurate the noise measurement: "In the near vicinity of the source, prediction accuracy may be within the range of ± 1 dB, while at greater distances this may deteriorate to ± 5 dB or greater . . . Generally, while dealing with the concept of noise contours, it is best not to think of them as absolute lines of demarcation on a map, such a topographical contours, but rather as bands of similar noise exposures, usually on the order of 5 dB wide."¹

The CNEL contours used to depict airport-related noise impact demarcate areas where overall noise is relatively severe; generally, these will be areas under or close to flight approach and take-off zones. Near the airport there may well be other areas subject to noise which is disturbing but which isn't frequent and/or intense enough to register a high CNEL level. The most prominent example of the intermittent but intense noise excluded from CNEL contours developed under the Division of Aeronautics airport noise standards is the jet engine test runup. If these intermittent noise sources create disturbance of such an order as to affect land use, they may properly be included in the airport land use plan.

Normalized CNEL

The state airport noise standards refer to noise impact on an urban environment, thus assuming a level of ambient noise in the 55-65 dB range. However, airport noise may be more pronounced and annoying in quieter rural and suburban locales.² In assessing noise impact the Airport Land Use Commission may wish to compensate for heightened sensitivity in areas where ambient noise (excluding airport-related noise) is approximately 55 dB or less and where existing or planned land uses, as designated in local general plans, are determined to be noise sensitive by adopting a "normalized" CNEL or reducing the level of acceptable airport noise in relation to sensitive uses. Elsewhere aircraft noise may be drowned in high ambient noise.

The normalized CNEL is obtained by adding or subtracting 5-10 dB to the initial CNEL rating, as depicted in Table II.³ This adjustment can be applied for all land use categories or used selectively for only those uses judged particularly sensitive or insensitive to noise. In either case, use of a normalized CNEL would call for measurement of ambient as well as airport noise levels and would require initial airport CNEL contours down to 55 or 60 dB. It should be pointed out that although normalization of the CNEL is suggested in the Office of Noise Control Noise Element Guidelines, in the EPA Information on Levels of Environmental Noise, and is even included in the Land Use Plan for surrounding Santa Clara County Airports, no active implementation of normalized CNEL has yet been reported.⁴

¹California Office of Noise Control, Noise Element Guidelines, p. 12.

²The record of complaints about aircraft noise offers a gauge of noise sensitivity. The EPA has observed that "widespread complaints may be expected when the normalized value of the outdoor day-night sound level of the intruding noise exceeds that existing without the intruding noise by approximately 5 dB" (Information on Levels of Environmental Noise, p. D-28).

³See p. 11

⁴California Office of Noise Control, Noise Element Guidelines, p. 28; Environmental Protection Agency, Information on Levels of Environmental Noise, p. D-18; Santa Clara County, Airport Land Use Policy Plan, pp. 7, 21. Information on implementation of the normalized CNEL comes from the Office of Noise Control, Berkeley, Calif.

Sound Insulation

Although the land use compatibility classification corresponds directly to CNEL levels, these CNEL calculations are a summation of single noise events: aircraft take-offs and landings. Particularly in the case of airport noise, the individual intermittent flights comprising the CNEL may be much louder and more disturbing than the CNEL might suggest. Table IV,¹ for example, reveals that a 65 CNEL may consist of 50 daily flights of approximately 83 dB each. Considering the fact that on the decibel scale, each 10 dB rise means a doubling of perceived "loudness," the discrepancy between CNEL and the single noise event can be an important matter for land use planning and noise insulation of structures.

At present, state and local standards for allowable interior noise protect only certain noise sensitive uses to ensure that the interior CNEL does not exceed a specified level (generally 45 dB). As an example, state noise insulation requirements, on which most local regulations are based, seek to ensure a maximum 45 dB annual interior CNEL in new hotels, motels, apartment houses, and dwellings other than detached single family units. Likewise, the state airport noise standards and the guidelines for general plan noise elements aim for a maximum 45 dB interior CNEL in noise sensitive uses. For other types of use-activity, such insulation standards do not exist.

Suppose, for example, that a proposed shopping center with a market and theater falls within the 65 dB contour:

- (1) At a hypothetical 100 aircraft operations per day, the maximum single event noise level would be approximately 80 dB (Table IV).
- (2) Table V indicates that a retail market should be exposed to a maximum interior level of 65 dB intermittent noise, a theater 45 dB.
- (3) The recommended noise reductions for those buildings would be 15 dB (that is, $80-65 \text{ dB} = 15 \text{ dB}$) and 35 ($80-45 \text{ dB} = 35 \text{ dB}$) respectively.

Department of Real Estate Reports

The California Business and Professions Code, Section 11010, provides for inclusion of information on nearby airports and applicable ALUC policies for land use in reports issued by the state Real Estate Commissioner on subdivided lands offered for sale or lease. Specifically, the subdivider must inform the Commissioner of all existing and proposed airports in city or county general plans within two miles of the subdivision. Any adopted ALUC noise and safety areas and applicable policies must also be included. This information is then incorporated in a public report which forms part of the Commissioner's authorization of sale or lease.

¹Appendix G.

APPENDIX A

STATUTES RELATING TO ALUC

PUBLIC UTILITIES CODE
ARTICLE 3.5 AIRPORT LAND USE COMMISSION

21670 Creation; membership; selection

There is hereby created in each county subject to this article and containing at least one airport operated for the benefit of the general public and served by an air carrier certified by the Public Utilities Commission or the Civil Aeronautics Board, an airport land use commission, hereinafter referred to as the "commission." Each commission shall consist of seven members to be selected as follows:

- (a) Two representing the cities in the county, appointed by a selection committee comprised of the mayors of all the cities within that county; provided, however, that if there are any cities contiguous or adjacent to the qualifying airport, at least one such representative shall be appointed therefrom. If there are no cities within a county, the number of representatives provided for by subdivisions (b) and (c) shall each be increased by one.
- (b) Two representing the county, appointed by the Board of Supervisors.
- (c) Two representing the airports within that county, appointed by a selection committee comprised of the managers of all of the public airports within that county; however, one such representative shall be appointed from an airport operated for the benefit of the general public.
- (d) One representing the general public, appointed by the other six members of the commission.

Each commission shall file a certificate of formation with the Secretary of State on or prior to January 1, 1971.

Public Officers, whether elected or appointed, may be appointed and serve as members of the commission during their terms of public office. Each member shall promptly appoint a single proxy to represent him in commission affairs and to vote on all matters when the member is not in attendance. The proxy shall be designated in a signed written instrument, which shall be kept on file at the commission offices, and the proxy shall serve at the pleasure of the member who appointed him. A vacancy in the office of proxy shall be filled promptly by appointment of a new proxy. (As amended by AB 1676, 1971 session)

21670.1 Action by designated body instead of commission

Notwithstanding any provisions of this article, if the board of supervisors and the selection committee of mayors in any county each makes a determination by a majority vote that proper land use planning can be accomplished through the actions of an appropriately designated body, then such body shall assume the planning responsibilities of an airport land use commission as provided for in this article and a commission need not be formed in that county. The Secretary of State shall be notified of such determinations by January 1, 1971.

21670.2 Applicability to counties having over 4 million population

Sections 21670 and 21670.1 do not apply to counties of more than 4 million population. In such counties, the county regional planning commission has the responsibility for coordinating the airport planning of public agencies within the county. In instances where impasses result relative to this planning, an appeal may be made to the county regional planning commission by any public agency involved.

The action taken by the county regional planning commission on such an appeal may be overruled by a four-fifths vote of the governing body of a public agency whose planning led to the appeal.

21671 Airport owned by city, district or county; appointment of certain members by cities and counties

In any county where there is an airport operated for the general public, and served by an aircarrier certified by the Public Utilities Commission or the Civil Aeronautics Board, which is owned by a city or district in another county or by another county, one of the representatives provided by subdivision (a) of Section 21670 shall be appointed by the mayors of the cities of the county in which the owner of that airport is located, and one of the representatives provided by subdivision (b) of Section 21670 shall be appointed by the board of supervisors of the county in which the owner of that airport is located.

21671.5 Term of office; removal of members; vacancies; compensation; staff assistance; meetings

Except for the terms of office of the members of the first commission, the term of office of each member shall be four years and until the appointment and qualification of his successor. The members of the first commission shall classify themselves by lot so that the term of office of one member is one year, of two members is two years, of two members is three years, and of two members is four years. The body which originally appointed a member whose term has expired shall appoint his successor for a full term of four years. Any member may be removed at any time and without cause by the body appointing him. The expiration date of the term of office of each member shall be the first Monday in May in the year in which his term is to expire. Any vacancy in the membership of the commission shall be filled for the unexpired term by appointment by the body which originally appointed the member whose office has become vacant. The chairman of the commission shall be selected by the members thereof.

Compensation, if any or reimbursement for necessary expenses, or both, shall be determined by the board of supervisors.

Staff assistance, including the mailing of notices and the keeping of minutes

Appendix A

shall be provided by the county.

The commission shall meet at the call of the commission chairman or at the request of the majority of the commission members.

21672 Rules and regulations

Each commission shall adopt rules and regulations with respect to the temporary disqualification of its members from participating in the review or adoption of a proposal because of conflict of interest and with respect to appointment of substitute members in such cases.

21673 Initiation of proceedings for creation by owner of airport

In any county when a commission has not been created by Section 21670, any owner of a public airport may initiate proceedings for the creation of a commission by presenting a request to the board of supervisors that a commission be created and showing the need therefor to their satisfaction.

21674 Powers and duties

The commission shall have the following powers and duties, subject to the limitations upon its jurisdiction herein set forth:

- (1) To study conditions and make recommendations concerning the need for height restrictions on buildings near airports.
- (2) To make recommendations for the use of the land surrounding airports to assure safety of air navigation and the promotion of air commerce.
- (3) To hold public hearings regarding the subject matter in subdivisions (1) and (2) and make findings of fact thereon which would be advisory only to the involved jurisdiction.
- (4) To make and enforce rules and regulations for the orderly and fair conduct of such hearings which shall conform as nearly as possible to the provisions applicable to hearings conducted by local agency formation commissions.

The powers of the commission shall *** in no way be construed to give the commission jurisdiction over the operation of any airport ***

- (5) To achieve by zoning compatible land uses in the vicinity of all new airports and in the vicinity of existing airports to the extent that the land in the vicinity of such airports is not already devoted to incompatible uses, and to this end the commissions shall require that all new construction in such areas shall conform to such standards as the department may from time to time adopt.

21675 Land use plan

- a) The commission shall formulate a comprehensive land use plan that will provide for the orderly growth of each public airport and the area surrounding the airport within the jurisdiction of the commission, and will safeguard the general welfare of the inhabitants within the vicinity of the airport and the public in general. The commission plan shall include a long-range master plan that reflects the anticipated growth of the airport during at least the next 20 years. This plan shall not be inconsistent with the State Master Airport Plan. In formulating a land use plan, the commission may develop height restrictions on buildings, may specify use of land, and may determine building standards, including soundproofing adjacent to airports, within the planning area.
- b) The commission may include within its plan formulated pursuant to subdivision (a) the area within the jurisdiction of the commission surrounding any federal military airport for all the purposes specified in subdivision (a). This subdivision shall not give the commission any jurisdiction or authority over the territory or operations of any such military airport. (As amended by AB 2207, 1973 Session)
- c) The planning boundaries shall be established by the commission after hearing and consultation with the involved agencies.

21676 Assistance of public agencies; approval of change of development plan

Each public agency having representation on the commission shall assist in the development of an area plan. All such plans must be filed with the commission for its approval. If in the determination of the commission, an action or regulation of any public agency within the boundaries of the area plan is inconsistent with the commission plan, then the commission shall hold a hearing to determine whether or not the proposed action is in the best interest of the airport and the adjacent area. If it is determined that the action would be harmful, then the public agency shall be notified and the public agency shall have another hearing to reconsider its action. The public agency proposing the action or regulation, however, may overrule the commission after such hearing by a four-fifths vote of its governing body.

Each public agency owning any airport within the boundaries of the area plan shall file any substantive change in development plans with the commission for its approval. If such plans are inconsistent with the commission plan, then the public agency shall be notified and shall have another hearing to reconsider its action. Such public agency, however, may overrule the commission by a four-fifths vote of its governing body.

21677 Notwithstanding the provisions of Section 21676 which require a four-fifths vote of the governing body of a public agency in order to overrule a commission, any public agency in the County of Marin may overrule the Marin County Airport Land Use Commission by a majority vote of its governing body.¹

¹Legislation presently applies to Marin County only.

PUBLIC UTILITIES CODE
ARTICLE 3. REGULATION OF AIRPORTS

21661 Exemptions

This article does not apply to airports owned or operated by the United States. To the extent necessary, the department may exempt any other class of airports, pursuant to a reasonable classification or grouping, from any rule or requirement thereof, promulgated under this article, if it finds that its application would be an undue burden on the class and is not required in the interest of public safety.

21661.5 Approval of construction plans; submission of plan to airport land use commission

No political subdivision, any of its officers or employees, or any person may submit any application for the construction of a new airport to any local, regional, state or federal agency unless the plan for such construction is first approved by the board of supervisors of the county, or the city council of the city, in which the airport is to be located and unless the plan is submitted to the appropriate commission exercising powers pursuant to Article 3.5 (commencing with Section 21670) of Chapter 4 of Part 1 of Division 9, and acted upon by such commission in accordance with the provisions of such article.

21662 Approval of sites; issuance of permits; charges

The department shall have the authority to approve airport sites and shall have authority to issue airport permits. No charge shall be made for the issuance of an approval or permit.

21663 Operation without permit

It is unlawful for any political subdivision, any of its officers or employees, or any person to operate an airport unless an appropriate airport permit required by rule of the department has been issued by the department and has not subsequently been revoked.

ASSEMBLY BILL 2357 (Fong)

Section 1. Section 21002 of the Public Utilities Code is amended to read:

21002. The purpose of this part is to further and protect the public interest in aeronautics and aeronautical progress by the following means:

- (a) Encouraging the development of private flying and the general use of air transportation.
- (b) Fostering and promoting safety in aeronautics.
- (c) Effecting uniformity of the laws and regulations relating to aeronautics consistent with federal aeronautics laws and regulations.

- (d) Granting to a state agency such powers and imposing upon it such duties that the state may properly perform its functions relative to aeronautics and effectively exercise its jurisdiction over persons and property, assist in the development of a statewide system of airports, encourage the flow of private capital into aviation facilities, and cooperate with and assist political subdivisions and others engaged in aeronautics in the development and encouragement of aeronautics.
- (e) Establishing only those regulations which are essential and clearly within the scope of the authority granted by the Legislature, in order that persons may engage in every phase of aeronautics with the least possible restriction consistent with the safety and the rights of others.
- (f) Providing for cooperation with the federal authorities in the development of a national system of civil aviation and for coordination of the aeronautical activities of those authorities and the authorities of this state.
- (g) Assuring that persons residing in the vicinity of airports are protected to the greatest possible extent against intrusions by unreasonable levels of aircraft noise.

Section 2. Section 21005 of the Public Utilities Code is amended to read:

21005. This part shall not be construed as limiting any power of the state or a political subdivision to regulate airport hazards by zoning.

It shall be the function of airport land use commissions created pursuant to Article 3.5 (commencing with Section 21670) of Chapter 4 to achieve by zoning compatible land uses in the vicinity of all new airports and in the vicinity of existing airports to the extent that the land in the vicinity of such airports is not already devoted to incompatible uses, and to this end the commissions shall require that all new construction in such areas shall conform to such standards as the department may from time to time adopt.

APPENDIX B

SUBCHAPTER 6. NOISE STANDARDS

Article 1. General

5000. Preamble. The following rules and regulations are promulgated in accordance with Article 3, Chapter 4, Part 1, Division 9, Public Utilities Code (Regulation of Airports) to provide noise standards governing the operation of aircraft and aircraft engines for all airports operating under a valid permit issued by the department. These standards are based upon two separate legal grounds: (1) the power of airport proprietors to impose noise ceilings and other limitations on the use of the airport, and (2) the power of the state to act to an extent not prohibited by federal law. The regulations are designed to cause the airport proprietor, aircraft operator, local governments, pilots and the department to work cooperatively to diminish noise. The regulations accomplish these ends by controlling and reducing the noise in communities in the vicinity of airports.

NOTE: Authority cited: Section 21669, Public Utilities Code. Reference: Section 21669 - 21669.4 Public Utilities Code.

History: 1. New Subchapter 6 (5000-5006, 5010-5014, 5020-5025, 5030-5032, 5035, 5040, 5045-5048, 5050, 5055, 5060-5064, 5065, 5070, 5075, 5080, 5080.1-5080.5) filed 10-25-70; designated effective 12-1-71 (Register 70, No. 48).

5001. Liberal Construction. This subchapter shall be liberally construed and applied to promote its underlying purposes which are to protect the public from noise and to resolve incompatibilities between airports and their surrounding neighbors.

5002. Constitutionality. If any provision of this subchapter or the application thereof to any person or circumstance is held to be unconstitutional, the remainder of the subchapter and the application of such provision to other persons or circumstances shall not be affected thereby.

5003. Provisions Not Exclusive. The provisions of this subchapter are not exclusive, and the remedies provided for in this subchapter shall be in addition to any other remedies provided for in any other law or available under common law. It is not the intent of these regulations to preempt the field of aircraft noise limitation in the state. The noise limits specified herein are not intended to prevent any local government to the extent not prohibited by federal law or any airport proprietor from setting more stringent standards.

5004. Applicability. These regulations establish a mandatory procedure which is applicable to and at all existing and future potential airports in California which are required to operate under a valid permit issued by the department. These regulations are applicable (to the degree not prohibited by federal law) to all operations of aircraft and aircraft engines which produce noise. Only those airports which shall have been determined to have a noise problem (in accordance with Section 5050) will be required to perform noise monitoring.

The regulations established by this subchapter are not intended to set noise levels applicable to litigation arising out of claims for damages occasioned by noise. Nothing herein contained in these regulations shall be construed to prescribe a duty of care in favor of, or to create any evidentiary presumption for use by, any persons or entity other than the State of California, the counties and airport proprietors in the enforcement of these regulations.

5005. Findings. Citizens residing in the vicinity of airports are exposed to the noise of aircraft operations. There have been numerous instances wherein individual citizens or organized citizen groups have complained about airport noise to various authorities. The severity of these complaints has ranged from a few telephone calls to organized legal action. Many of these cases have been studied by acoustics research workers under sponsorship of governmental and private organizations. These studies have generally shown that the severity of the complaint is principally associated with a combination of the following factors:

- (a) Magnitude and duration of the noise from aircraft operations;
- (b) Number of aircraft operations; and
- (c) Time of occurrence during the day (daytime, evening or night).

There are many reasons given by residents for their complaints; however, those most often cited are interference with speech communication, TV, and sleep. A number of studies have been made related to speech interference and hearing damage, and some studies have been made related to sleep disturbance and other physiological effects. These studies provide substantial evidence for the relationship between noise level and its interference with speech communication and its effect relative to hearing loss. Significantly less information is available from the results of sleep and physiological studies.

In order to provide a systematic method for evaluating and eventually reducing noise incompatibilities in the vicinity of airports, it is necessary to quantify the noise problem. For this purpose, these regulations establish a procedure for defining a noise impact area surrounding an individual airport. The criteria and noise levels utilized to define the boundaries of the noise impact area have been based on existing evidence from studies of community noise reaction, noise interference with speech and sleep and noise induced hearing loss.

One of the fundamental philosophies underlying the procedures in these regulations is that any noise quantity specified by these regulations be measurable by relatively simple means. Therefore, these regulations utilize as their basic measure the A-weighted noise level, which is the most commonly accepted simple measure. To insure consistency between criteria and measurement, the units for the criteria are also based on the A-weighted sound level rather than one of the several more complex perceived noise levels.

These regulations provide a procedure to limit the allowable noise for an individual aircraft flyby measured at specified points in the vicinity of the airport. The noise limits are specified in terms of the class of aircraft and measurement location.

The level of noise acceptable to a reasonable person residing in the vicinity of an airport is established as a community noise equivalent level (CNEL) value of 65 dB for purposes of these regulations. This criterion level has been chosen for reasonable persons residing in urban residential areas where houses are of typical California construction and may have windows partially open. It has been selected with reference to speech, sleep and community reaction.

It is recognized that there is a considerable individual variability in the reaction to noise. Further there are several factors which undoubtedly influence this variability and which are not thoroughly understood. Therefore, this criterion level does not have a degree of precision which is often associated with engineering criteria for a physical phenomenon (e.g., the strength of a bridge, building, et cetera). For this reason, the state will review the criterion periodically, taking into account any new information which may become available.

5006. Definitions. (a) Sound Pressure Level (SPL): The sound pressure level, in decibels (dB), of a sound is 20 times the logarithm to the base of 10 of the ratio of the pressure of this sound to the reference pressure. For the purpose of these regulations, the reference pressure shall be 20 micronewtons/square meter (2×10^{-4} microbar).

(b) Noise Level (NL): Noise level, in decibels, is an A-weighted sound pressure level as measured using the slow dynamic characteristic for sound level meters specified in ASA S1.4--1961, American Standard Specification for General Purpose Sound Level Meters, or latest revision thereof. The A-weighting characteristic modifies the frequency response of the measuring instrument to account approximately for the frequency characteristics of the human ear. The reference pressure is 20 micronewtons/square meter (2×10^{-4} microbar).

(c) Noise Exposure Level (NEL): The noise exposure level is the level of noise accumulated during a given event, with reference to a duration of one second. More specifically, noise exposure level, in decibels, is the level of the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on the reference pressure of 20 micronewtons per square meter and reference duration of one second.

(d) Single Event Noise Exposure Level (SENEL): The single event noise exposure level, in decibels, is the noise exposure level of a single event, such as an aircraft flyby, measured over the time interval between the initial and final times for which the noise level of a single event exceeds the threshold noise level. For implementation in this subchapter of these regulations, the threshold noise level shall be at least 30 decibels below the numerical value of the single event noise exposure level limits specified in Section 5035.

(e) Hourly Noise Level (HNL): The hourly noise level, in decibels, is the average (on an energy basis) noise level during a particular hour. Hourly noise level is determined by subtracting 35.6 decibels equal to $10 \log_{10} 3600$ from the noise exposure level measured during the particular hour, integrating for those periods during which the noise level exceeds a threshold noise level.

For implementation in this subchapter of these regulations, the threshold noise level shall be a noise level which is 10 decibels below the numerical value of the appropriate criterion CNEL which is specified in Section 5012. At some microphone locations sources of noise other than aircraft may contribute

to the CNEL. Where the airport proprietor can demonstrate that the accuracy of the CNEL measurement will remain within the required tolerance in Section 5045, the department may grant a waiver to increase the threshold noise level.

(f) Daily Community Noise Equivalent Level (CNEL): Community noise equivalent level in decibels, represents the average daytime noise level during a 24-hour day, adjusted to an equivalent level to account for the lower tolerance of people to noise during evening and night time periods relative to the daytime period. Community noise equivalent level is calculated from the hourly noise levels by the following:

$$\text{CNEL} = 10 \log \frac{1}{24} \left[\sum \text{antilog} \frac{\text{HNLD}}{10} + 3 \sum \text{antilog} \frac{\text{HNLE}}{10} + 10 \sum \text{antilog} \frac{\text{HNLN}}{10} \right]$$

Where

HNLD are the hourly noise levels for the period 0700-1900 hours;
 HNLE are the hourly noise levels for the period 1900-2200 hours;
 HNLN are the hourly noise levels for the period 2200-0700 hours;
 and \sum means summation.

(g) Annual CNEL: The annual CNEL, in decibels, is the average (on an energy basis) of the daily CNEL over a 12-month period. The annual CNEL is calculated in accordance with the following:

$$\text{Annual CNEL} = 10 \log_{10} \left[\frac{1}{365} \sum \text{antilog} \left(\frac{\text{CNEL}(i)}{10} \right) \right]$$

Where

CNEL(i) = the daily CNEL for each day in a continuous 12-month period,
 and \sum means summation

When the annual CNEL is approximated by measurements on a statistical basis, as specified in Section 5022, the number 365 is replaced by the number of days for which measurements are obtained.

(h) Noise Impact Boundary: Noise impact boundary around an airport consists of the locus of points for which the annual CNEL is equal to the criterion value.

(i) Noise Impact Area: Noise impact area, in square statute miles, is the total land area within the noise impact boundary less that area deemed to have a compatible land use in accordance with Section 5014.

(j) Airport Proprietor: Airport proprietor means the holder of an airport permit issued by the department pursuant to Article 3, Chapter 4, Part 1, Division 9, Public Utilities Code.

(k) Aircraft Operator: Aircraft operator means the legal or beneficial owner of the aircraft with authority to control the aircraft utilization; except where the aircraft is leased, the lessee is the operator.

(1) Air Carrier: Air carrier is any aircraft operating pursuant to either a federal or a state certificate of public convenience and necessity, including any certificate issued pursuant to 49 U.S.C. Section 1371 and any permit issued pursuant to 49 U.S.C. Section 1372.

(m) General Aviation: General aviation aircraft are all aircraft other than air carrier aircraft and military aircraft.

(n) Department: Department means the Department of Aeronautics of the State of California.

(o) County: County, as used herein, shall mean the county board of supervisors or its designee authorized to exercise the powers and duties herein specified.

Article 2. Airport Noise Limits

5010 Purpose. The purpose of these regulations is to provide a positive basis to accomplish resolution of existing noise problems in communities surrounding airports and to prevent the development of new noise problems. To accomplish this purpose, these regulations establish a quantitative framework within which the various interested parties (i.e., airport proprietors, aircraft operators, local communities, counties and the state) can work together effectively to reduce and prevent airport noise problems.

5011. Methodology for Controlling and Reducing Noise Problems. The methods whereby the impact of airport noise shall be controlled and reduced include but are not limited to the following:

(a) Encouraging use of the airport by aircraft classes with lower noise level characteristics and discouraging use by higher noise level aircraft classes;

(b) Encouraging approach and departure flight paths and procedures to minimize the noise in residential areas;

(c) Planning runway utilization schedules to take into account adjacent residential areas, noise characteristics of aircraft and noise sensitive time periods;

(d) Reduction of the flight frequency, particularly in the most noise sensitive time periods and by the noisiest aircraft;

(e) Employing shielding for advantage, using natural terrain, buildings, et cetera; and

(f) Development of a compatible land use within the noise impact boundary.

Preference shall be given to actions which reduce the impact of airport noise on existing communities. Land use conversion involving existing residential communities shall normally be considered the least desirable action for achieving compliance with these regulations.

5012. Airport Noise Criteria. Limitations on airport noise in residential communities are hereby established.

(a) The criterion community noise equivalent level (CNEL) is 65 dB for proposed new airports and for vacated military airports being converted to civilian use.

(b) Giving due consideration to economic and technological feasibility, the criterion community noise equivalent level (CNEL) for existing civilian airports (except as follows) is 70 dB until December 31, 1985, and 65 dB thereafter.

(c) The criterion CNEL for airports which have 4-engine turbojet or turbofan air carrier aircraft operations and at least 25,000 annual air carrier operations (takeoffs plus landings) is as follows:

Date	CNEL in decibels
Effective date of regulations to 12-31-75-----	80
1-1-76 to 12-31-80-----	75
1-1-81 to 12-31-85-----	70
1-1-86 and thereafter-----	65

5013. Noise Impact Boundary. The noise impact boundary at airports which have a noise problem as determined in accordance with Section 5050 shall be established and validated by measurement in accordance with the procedures given in Article 3 of this subchapter. For proposed new airports, or for anticipated changes of existing airports, the noise impact boundary shall be estimated by applicable acoustical calculation techniques.

The area of land which is within the noise impact boundary and which has incompatible land use is utilized as a measure of the magnitude of the noise problem at an airport. The concepts of noise impact boundary and noise impact area are illustrated in Figure 1. [Omitted]

5014. Compatible Land Uses Within the Noise Impact Boundary. The criterion for the noise impact boundary was established for residential uses including single-family and multiple-family dwellings, trailer parks, and schools of standard construction. Certain other land uses may occur within the boundary but be compatible with the community noise equivalent level and hence be excluded in the calculation of noise impact area. For this purpose, the following land uses are deemed compatible:

- (a) Agricultural;
- (b) Airport property;
- (c) Industrial property;
- (d) Commercial property;
- (e) Property subject to an avigation easement for noise;
- (f) Zoned open space;
- (g) High-rise apartments in which adequate protection against exterior noise has been included in the design and construction, together with a central air conditioning system. Adequate protection means the noise reduction (exterior to interior) shall be sufficient to assure that interior community noise equivalent level in all habitable rooms does not exceed 45 dB during aircraft operations. Acoustical performance of the buildings shall be verified by calculation or measured by qualified officials of the building inspection agency of the city or county in which the buildings are situated;

(h) In the case of existing airports and existing homes only, residential areas in which existing homes have been acoustically treated need not be subject to exterior noise limits quite as strict as those for normal residential construction. For this purpose, the community noise equivalent level on the boundary of such a residential area may be increased by as much as 15 dB over the community noise equivalent level criterion for nonacoustically treated homes. The amount of the increase allowed on the boundary is the difference between the noise level reduction of the treated home and the value 20 decibels which is assumed to be the noise level reduction of an average normal residence. The noise level reduction of a home is defined as the average difference between aircraft noise levels in free space outside of the home and the corresponding noise levels in rooms on the exposed sides of the home.

In carrying out this section, the actual use to which the land is put, not the classification for which the land is zoned, is determinative.

Article 3. Establishing and Validating Noise Impact Boundaries for Airports Required to Monitor

5020. Validation of the Noise Impact Boundary. For airports with a noise problem (in accordance with Section 5050), the noise impact boundary shall be validated by measurements made at locations specified in Section 5021 and according to frequency requirements specified in Section 5022. These measurements shall be utilized to calculate the daily community noise equivalent levels. These daily CNEL values will then be averaged (on an energy basis) to obtain the annual CNEL at each of the community measurement locations. The location of the noise impact boundary will be considered valid if the value of the annual CNEL lies within ± 1.5 dB of the criterion value.

5021. Community Measurement Locations. At least twelve (12) locations, approximately equidistant, but not exceeding one and one-half (1.5) statute miles separation, shall be selected along the noise impact boundary. The locations shall be selected such that the maximum extent of the boundary be determined with reference to the airport's flight patterns.

5022. Frequency of Measurement at Community Locations. (a) For airports with 1,000 or more homes within the noise impact boundary based on a CNEL of 70 dB, continuous monitoring is required at those monitoring positions which fall within residential areas. Measurement for at least 48 weeks in a year shall be considered as continuous monitoring.

(b) For all other locations and for all locations at other airports, an intermittent monitoring schedule is allowed. The intermittent monitoring schedule shall be designed so as to obtain the resulting annual CNEL as computed from measurements at each location which will correspond to the value which would be measured by a monitor operated continuously throughout the year at that location, within an accuracy of ± 1.5 dB.

Thus, it is required that the intermittent monitoring schedule be designed so as to obtain a realistic statistical sample of the noise at each location. As a minimum, this requires that measurements be taken continuously for 24-hour periods during four 7-day samples throughout the year, chosen such that for each sample, each day of the week is represented, the four seasons of the year are represented, and the results account for the effect of annual proportion

of runway utilization. At most airports, these intermittent measurements can be accomplished by a single portable monitoring instrument.

5023. Initial Establishment of the Noise Impact Boundary. The method to be used for initial establishment of the noise impact boundary of airports required to monitor will vary depending upon specific situations. The following guidelines represent one possible method:

(a) Calculate the approximate location of the noise impact boundary using applicable acoustic estimation techniques.

(b) Select convenient measurement locations on this estimated boundary according to Section 5021.

(c) Make a suitable series of CNEL trial measurements along lines perpendicular to the estimated noise impact boundary. For example, two to three measurements over a one-to-seven day period along a line perpendicular to the estimated noise impact boundary should provide sufficient data, to define within the required accuracy, the nominal position of the noise impact boundary.

Due consideration should be given to the number and time period of aircraft operations, mix of aircraft classes, average runway utilization and other measurable factors which would cause a difference between the trial measurements of CNEL and the expected annual average.

(d) Initiate validation measurements of the noise impact boundary following selection of permanent or intermittent monitoring locations to comply with the validation accuracy criterion specified in Section 5020. For permanent measurement locations at which the measured CNEL lies outside this accuracy criterion, suitable auxiliary measurements or analytical methods may be used to extrapolate the measured CNEL to determine the value on the noise impact boundary. Such extrapolation procedures are subject to approval by the department.

5024. Deviations from Specified Measurement Locations. Recognizing the unique geographic and land use features surrounding specific airports, the department will consider measurement plans tailored to fit any airport for which the specified CNEL monitoring locations are impractical. For example, monitors should not be located on bodies of water or at points where other noise sources might interfere with aircraft CNEL measurements, nor are measurements required in regions where land use will clearly remain compatible.

5025. Alternative Measurement Systems. The acquisition of measurement systems that are more extensive or scientifically more refined than those specified herein is encouraged, particularly at airports with a major noise problem, where compliance with the intent of Section 5075(a) (4) requires more comprehensive noise monitoring, particularly to monitor noise abatement procedures. Airports contemplating the acquisition of such monitoring systems may apply to the department for exemptions from specific monitoring requirements set forth in this subchapter of these regulations.

APPENDIX C

ANALYSIS OF MOIA NOISE STUDIES

The following discussion contains first a section on current noise contours measured near Oakland Airport, followed by information on recent "forecasts." The discussion is intended to assist the Commission in re-evaluating its adopted "line of demarcation" (forecast 65 dB CNEL)¹ for Bay Farm Island, which is affected by departures from Oakland North and South Fields and engine test runs, and adopting a noise impact area for lands in Oakland and San Leandro affected by approaches to the two airfields.

1. Current Contours

There are several sources of information on "current" levels of noise from flights taking off and landing at the North and South Airports: a study prepared by Wyle Laboratories² for the City of Alameda, used in the city Noise Element;³ and the contours prepared for the Port of Oakland for its Draft Environmental Impact Report in 1974.⁴ Additionally, quarterly monitoring of South Airport departures at two points on Bay Farm Island provides ongoing information of the noise impact there.⁵

1.1 Wyle Laboratories study: Using monitored data taken from four points on Bay Farm Island in February 1973, in combination with data on the configuration of the airport runways and ground tracks, aircraft traffic statistics (October 1974 - September 1975), and aircraft takeoff and landing profiles, the Wyle study represented several "cases" of current "65 dB" CNEL noise over Bay Farm Island. The first ("Case A") assumed business jet operations at the North Field and included San Francisco Airport overflights, which alone produce approximately 60 dB CNEL over the Island; the second ("Case B") excluded the San Francisco flight noise; the third ("Case C") both excluded San Francisco overflights and assumed, in conformity with the Board of Port Commissioners' Resolution 23150,⁶ that business jet traffic would be moved from the North to the South Airport.⁷

In dealing with the North Field, the study assumed that all light propeller aircraft make a required immediate right turn after takeoff (over the golf course), rendering their noise so negligible as to be excluded from the study. Table 3-3 in the Wyle Study lists those North Field operations considered to have a noise impact in Cases A and B but removed to the South runway 29 in Case C, thus excluding the North Field operations from further noise consideration.⁸

¹The line of demarcation was adopted by the Commission on October 10, 1973, (Resolution No. 8).

²Wyle Research Report WCR 76-1, CNEL Contour Study for Municipal Oakland International Airport, April 1976.

³City of Alameda, Noise Element, September 1976.

⁴Port of Oakland, Airport Master Plan Environmental Impact Report, certified August 1977.

⁵See Appendix D.

⁶Appendix E of Policy Plan.

⁷Training flights were not counted at the South Airport in Case "C", as their noise impact was found to be insignificant.

⁸The cases are defined as follows (Wyle, p. 4-1):

"Case A All traffic, including SFO overflights; Case B Oakland traffic only (like Case A, but no SFO overflights); Case C Oakland traffic only, without training flights, no SFO overflights, and all traffic on runways 27L and 27R removed to runways 29-11."

Case C, represented in Map XV ("Settlement Agreement" line), is significant because it was used by the City of Alameda in its Noise Element to represent current conditions on the Island; with one alteration of less than ten acres the 65 dB contour from Case C was also recognized in the Settlement Agreement signed by the Port of Oakland, City of Alameda, Harbor Bay Isle Associates, et. al.¹

1.2 Port of Oakland: The most recent contours for the Airport as a whole were carried out by Bolt, Baranek and Newman (BBN) for the Port of Oakland in 1974 and were included in the Draft Environmental Impact Report for the proposed Airport Master Plan.² Airport operations from April 1973 - March 1974 provided the data base.³ These contours are particularly important because they are the most recent available on noise impact in the San Leandro area. Thus, they provided the basis for the "current" assessment of airport noise impact in San Leandro's proposed noise element.⁴

Unlike Wyle Case C, the BBN study did not exclude the North Field altogether but reflected a limited use of this field for landings by business jets and noisier propeller-driven aircraft as well as light general aviation aircraft.

Since the time of the BBN study, Resolution 23150 has superseded a Port policy⁵ discouraging use of the North Field by jets, so that noise impact from this airport may have decreased.

1.3 Monitoring: Because of the Alameda County Board of Supervisors Resolution 144246 in June 1972, declaring that the airport has a noise problem, quarterly monitoring is carried out by the Port of Oakland and an average annual CNEL is determined. In implementing the monitoring provisions of the state airport noise standards it was decided by the Division of Aeronautics that only the South Airport need be monitored, as it is the major noise source. Monitoring takes the form of quarterly sampling. As a result of the monitoring, it has been found that the airport currently has a "zero noise impact area"--that is, no residences are located within the current airport noise standards 75 dB CNEL criterion level. The monitoring continues, however, and provides a continuing source of information on aircraft takeoff noise impact.

Comparing monitoring information with the Wyle and BBN contours, it will be observed that both sets of contours appear to slightly overstate the noise level. It must be remembered, however, that neither the sampled monitoring nor the contour studies can be precisely accurate: their measures are at best within \pm 1.5 dB and perhaps - particularly where the contours represent points more distant from the aircraft noise source - as much as \pm 3 dB. The CNEL is in effect a band, not a line.

¹ Settlement Agreement between the City of Oakland, City of Alameda, Harbor Bay Isle Associates, Reclamation District No. 2105; July 21, 1976.

² Oakland Airport Master Plan Draft Environmental Impact Report 1974. These contours were used in the subsequent revised EIR, dated May 1977.

³ Ibid; p. D-51 - D-55 (1974 document).

⁴ November 1976.

⁵ The policy was adopted in January 1974 by the Board of Port Commissioners.

1.4 Test runups: Neither the Wyle nor BBN study includes noise from engine test runups, although the location of jet aircraft maintenance facilities on the North Airport makes this noise source close to existing and prospective Bay Farm Island residents. The Alameda Noise Element discusses runups in some detail, making abatement recommendations, but does not provide actual measures of the noise level.¹ In the Settlement Agreement between the Port of Oakland, City of Alameda, Harbor Bay Isle Associates, and Reclamation District No. 2105, it is provided that Harbor Bay Isle Associates and the City of Alameda will not bring a complaint against the Port for test runups 70 dBA or less between 7 p.m. and 10 p.m. and 65 dBA or less between 10 p.m. and 7 a.m.² Even at the level sanctioned in the Settlement Agreement, this intermittent noise can be a significant disturbance to residences. In the Agreement, the Port has made a commitment to abatement of engine test runup noise upon completion of a specified annexation arrangement between Oakland and Alameda.

1.5 San Francisco overflights: Because the BBN study is concerned only with the impact of the Oakland Airport, it does not consider composite noise from Oakland and San Francisco airport overflights. The Wyle study does discuss the added noise from San Francisco flights but only in cases which do not represent current Oakland Airport operating procedures established by Resolution 23150--that is, San Francisco overflights are not combined with a North Field "jet ban." The San Francisco-originated noise is in 60-65 dB CNEL range.³

2. Future Noise Impact

2.1 Introduction: Assessment of the future noise levels resulting from aircraft operations can be undertaken in several ways. Most common has been the method of forecasting based on air traffic demand, used for instance by the FAA and in various regional studies. In contrast, MTC has adopted future passenger allocations for Bay Area airports.⁴ Translating travel demand into aircraft operations and noise impact requires assumptions concerning the passengers per flight, aircraft fleet mix, noise characteristics of this anticipated fleet, and other factors seen to directly influence future noise levels.

¹Alameda, Noise Element, p. 68-70.

²The noise would be measured "at the nearest present residential property on Bay Farm Island" (Settlement Agreement, p. 8).

³Alameda, Noise Element, p. 21.

⁴See: Metropolitan Transportation Commission, Regional Plan Update Program, Phase I Summary, "Aviation Forecasts," p. 14-40; Regional Transportation Plan, 1976.

Upon these demand forecasts and allocations, constraints may be placed: airport runway and airspace capacity, access to the airport, and other capacity limitations which may directly affect operations. For MOIA the most limiting factor could be access, as the existing surface transportation access system is estimated to have a capacity of 6 million annual passengers (MAP). The South Airport runway 29, on the other hand, may reach its limits at 13 MAP (again, this figure depends on many operational assumptions).

A less obvious but potentially important constraint on airport operations can be the capacity of lands surrounding to accommodate airport impacts. While it is not correct to describe as a "forecast" an upper limit of operations based on noise impact, setting maximum allowable noise impact contours is clearly one way of handling future noise levels.

Concern for noise impact is essentially the consideration behind Resolution 23150 leading to limitation of North Airport use to light, non-jet aircraft. Additionally, the California Airport Noise Standards deal with this balance between land use and permissible noise levels: as the Alameda Noise Element points out, "Although temporary variances are provided for and limited exceptions can be employed, the basic thrust of the regulations is to require airport operators to run their airports in such a fashion that the Annual Community Noise Equivalent Level measurement does not exceed 75 dB today, 70 dB by 1981, and 65 dB by 1986 in residential areas of the type existing today on Bay Farm Island."¹

The balancing of forecast or allocated demand with noise sensitivity of near-airport land use is one aspect of ALUC deliberations in delineating a noise impact area. Essentially, the contours recognized by the ALUC imply policy in that they suggest that uses allowed to develop outside the impact area will continue to be outside the range of airport impacts. However, since the Commission has no authority over airport operations, this continued compatibility cannot be safeguarded by the Policy Plan. (Additionally, of course, a local jurisdiction which disagrees with an ALUC judgement of incompatibility which is not in the public and airport interest may override the Commission as described in Chapter I.)

Concern for future enforcement of the airport noise standards and a desire to ensure that new residential development will not become incompatible with airport operations has led to concentration on forecasting the 65 CNEL contour. Thus, several studies of future noise do not include a range of contours in 5 dB intervals down to 60 dB. Such a range is required for full application of proposed noise/land use compatibility standards.

2.2 ALUC Line of Demarcation: The policy line adopted by the ALUC is depicted on Map XV, along with several other 65 CNEL forecasts.² Adopted in October 1973, this "line of demarcation" does not correspond to a contour from a particular study but marks a compromise between forecast levels of the 65 CNEL for 1985 made by the Port of Oakland

¹Noise Element, p. 92.

²Appendix C, Interim Land Use Plan For Bay Farm Island.

TABLE III

Land Use Within Current and Selected Forecast
65 CNEL Contours on Bay Farm Island

Land Use within 65 CNEL	Contours			
	"a" 7.5 MAP, jets on North Field	"b" ALUC line of demarcation	"c" settlement agreement	"d" 7.5 MAP, no jets on North Field
Existing residences	1700 (all dwellings on BFI)	1570	860	1025
Potential new dwellings density 5-7 units/acre	1425- 1995	1225- 1715	700- 980	950- 1330
Undeveloped, residentially- zoned (acres)				
Total	285	245	140	190
HBI	215	180	90	140
Other	70	65	50	50

(BBN) and the consultant to Harbor Bay Isle Associates. Whereas the Port had estimated that by 1985 the airport would be operating at 13 MAP capacity (179,000 operations annually) and foresaw a 65 CNEL north of McCartney Road, the consultant contended that air traffic would be less and the 65 CNEL would fall near Catalina Avenue. The ALUC line follows the consultant's 65 dB CNEL measure for 1972 for the stretch between McCartney/Verdamer and the western end of Bay Farm Island. The line assumes reduced jet traffic on the North Field and does not include the San Francisco overflights or on-ground aircraft noise.

Table III includes an evaluation of the implications of the ALUC line of demarcation for future Bay Farm Island land use, assuming that areas exposed to noise 65 CNEL or higher are unsuitable for new residential and other noise-sensitive uses. The alignment along McCartney Road would prevent development of up to 1700 new dwellings south of this line (until or unless the noise impact recedes southward). It should be pointed out that the ALUC line in no way resolves the problem of over 1500 existing residences within the noise impact areas. If in fact the measured 65 dB CNEL were determined to come up to the ALUC line in 1986 or thereafter, thus rendering the Airport noise level incompatible with these residences, the Airport would be faced with violation of the Noise Standards.

- 2.3 Settlement Agreement: The recent Settlement Agreement between the Port of Oakland, City of Alameda and Harbor Bay Isle Associates recognizes a line (based on the "current hypothetical" 65 dB CNEL depicted in the Alameda Noise Element¹) which has land use implications contravening those of the ALUC line of demarcation. While the Agreement does not itself project or establish policies for future noise levels, it does not conflict with those set forth in the Alameda Noise Element (see next section), which takes the position that the area under the 65 dB CNEL will not increase but may not decrease within the next decade. The Agreement provides a "noise easement" option for Harbor Bay Isle property within the line recognized in the Settlement Agreement; according to the Agreement, residential development in this area would thus be certain to comply with the California Airport Noise Standards. Translated into land use terms, development of the area within noise easement option would mean an additional 700-980 dwellings on the Island (Table III).
- 2.4 City of Alameda Noise Element: Rather than rely on a specific forecast of noise the Element states: "it is assumed that the CNEL contours from Oakland Airport will be reduced over the years. In the meantime, however, a reasonable approach to development of the Island, from the point of view of noise compatibility, would be to encourage development on the Island with a CNEL lower than 65 dB first, with the development of areas with a higher than 65 dB later."² Elsewhere, the Element estimates the amount of long-range decrease from current noise levels will be 5 dB.

¹City of Alameda, Noise Element, "Community Noise Environments Map," p. 91. An adjustment in the Noise Element 65 CNEL was made to place all of Harbor Bay Isle "Village I" north of the "65 CNEL" contour.

²Noise Element, p. 92.

Backing up its position, the City calls for continuous monitoring and application of the adopted noise/land use compatibility standards¹ based on the results. Since no policy on noise easements is mentioned, it might be presumed that adopted Noise Element policies would prevail: new residential development within the current 65 CNEL contour (see Map XV) would be discouraged. Land use complications of implementing the City policies north and south of this line are summarized in Table III. As mentioned previously, this CNEL is selected from the Wyle study and represents Case C: Oakland Airport Runway 29 noise only, no training flights, jet traffic moved from the North Field to the South Airport.

The City of Alameda prediction of a "long run" - perhaps several decades - decline in airport noise rests on several considerations. First, the Element observes that only by reducing the 65 dB CNEL to Catalina Avenue or south can the airport meet the 1986+ noise standards as strictly interpreted.² (Such a marked reduction is unlikely, however, by 1986). Secondly, it is anticipated that introduction of "quiet" aircraft complying with Federal Aviations Part 36 or a revised Part 36 could yield a significant reduction in noise impact.

More detailed support for the Alameda position comes from the Wyle Report, which uses a matrix of possible future airport operation levels and aircraft noise reduction assumptions to forecast future "cases" of noise from the South Airport. These cases, not an official part of the Noise Element per se, are analyzed in the following section.

2.5 Wyle/Thompson noise estimates: In addition to assessing current noise levels at Bay Farm Island, the Wyle Report depicts a range of potential future levels given various assumed conditions: MAP ranges from 3.5 to 13 are translated into assumptions about fleet mix, rate of replacement of the existing fleet with new jets meeting FAR Part 36, and so forth.³ Two basic cases of airport operating procedures were distinguished, one with forecast business jet traffic using North Field, another assigning this traffic to the South Airport. Table III summarizes the potential land use impact of several of the contours if used to guide policy decisions. One interesting feature of these estimates is that whatever the operating conditions at the Airport (that is to say, Cases "A", "B", or "C")⁴ the noise impact on BFI is shown not to rise for MAP's up to 7.5 (as compared with the "current" 2.09 MAP). This is true even under "existing fleet" technical assumptions, where by positing that 10-20% of certain aircraft will be "quiet" and the remaining non-retrofit and by making certain other analytical simplifications, it is estimated that at 3.5 and 5.0 MAP the noise levels will be lower than at the current existing fleet.

¹Ibid., p. 86-88.

²Ibid., p. 35.

³Preparation of the technical data for the forecasts was carried out by Arnold Thompson Associates.

⁴See Page 65 for explanation of these cases.

Not surprisingly, it was found that JT8D retrofit,¹ which is relatively ineffective in reducing take-off noise, would yield little noise relief on Bay Farm Island.

2.6 Other contour forecasts for airport departures: Other than the Wyle Report, the only future contours for the Oakland Airport prepared within the last three years are those presented in the Draft Environmental Impact Report for the Oakland Airport Master Plan.² These contours represent a 4 MAP, 1981, case and show greater noise impact than an "alternative" noise estimate for 1981 (Wyle, 3.5 MAP).

2.7 Summary of Alternative Future Noise Levels on Bay Farm Island: Table III summarizes the potential land use impact of various "alternative" forecast locations of the 65 dB CNEL. For contours, see Map XV.

2.7.1 In terms of noise impact, the optimum conditions would see 65 CNEL noise reduced to Catalina Avenue or south thus placing all existing development outside the contour. Such a "contour" cannot serve as an ALUC policy line as long as it is exceeded by the existing noise impact from the airport.

2.7.2 A forecast of decreasing noise would justify using the existing 65 dB CNEL as the "line of demarcation." As previously mentioned, this case is supported by the City of Alameda as a long-range policy of removing noise impact from existing residential areas.

The city Noise Element does not discuss in detail the basis for this assumed noise decline, although the Wyle Report, which provided technical material for the Element, did define a range of future noise levels.

2.7.3 A more moderate case, in terms of balancing noise impact and air operations, is represented by line "d" (Wyle 7.5 MAP, Case C). This is the level estimated by the Port of Oakland in its revised Airport Master Plan Draft Environmental Impact Report, which foresees approximately 6 MAP at the airport by 1986. This noise line for 7.5 MAP depends on the introduction of aircraft meeting FAR Part 36 and on an increased number of passengers boarding per flight; all business jets would be prohibited from the North Airport; San Francisco overflights are not included. While noise would not rise significantly over current levels, operations would increase from approximately 80,000 at present to 124,500.

Even if the "moderate" 7.5 MAP, Case C were judged a reasonable estimate of maximum future noise levels, over 1000 existing dwellings would fall within a 65+ dB contour, and after 1985 would form a "noise impact area" for the airport. This total is less than the number of existing residences inside the ALUC line but represents a 160-170 dwelling increase over the Settlement Agreement line. The 7.5 MAP, Case C also places approximately 190 acres of undeveloped residentially-zoned land within the anticipated 65+ dB CNEL contour, rendering them unadvisable for this use according to proposed ALUC policies and the airport noise standards.

¹JT8D retrofit would apply sound reducing measures to current narrow-bodied 727, 737, and DC-9 aircraft so that they would meet FAR Part 36 standards for new aircraft.

²Port of Oakland, Airport Master Plan, Draft Environmental Impact Report, May 1977.

2.7.4 Under two conditions the noise impact from the Oakland Airport could be significantly more severe than the 7.5 MAP, Case C: use of the North Field by business jets and increase in traffic from the South Airport to a service level approaching its estimated 13 MAP capacity.

A 13 MAP case depicted in the Wyle Report assumes all aircraft to comply with FAR Part 36, a 65% boarding factor,¹ over 66,000 annual departures, and use of the South Airport rather than the North Field by twelve business jets daily. These conditions are unlikely before 1990, at the earliest.

According to the calculations in the Wyle study, use of business jets on the North Field runways² would have the greater overall impact on the Island because of high noise which would affect existing residences near this airport. Thus, the 7.5 MAP with jet traffic on the North Field is used in this discussion to generally represent "severe noise impact."

Anticipation of the level of noise depicted in "7.5 MAP, jet traffic on NF" would remove over 280 acres of vacant, residentially-zoned land from development for this use and would place all existing dwellings within at least 65 dB CNEL.

3. North Field Operations

It is clear that the long-range prospects for operations at the North Field can greatly affect forecast noise on Bay Farm Island. Currently, the Board of Port Commissioner's Resolution 23150 excludes business jets and certain heavier propeller-driven aircraft. Although established primarily for noise abatement, this ban also has the effect of reducing straightout flights by heavier aircraft, thus cutting risk of accidents in nearby neighborhoods. The Resolution is reinforced by provisions in the recent Settlement Agreement, which cites the possibility of formalizing these restrictions by setting up a preferential runway system.³ These considerations, along with Port support of a noise forecast assuming a North Field jet ban, point to limiting the North Field operations to light, non-jet general aviation aircraft except when the South Airport runway is not open to full use.

On the other hand, there are certain factors which might encourage opening the North Field to business jets: convenient location of this facility relative to other general aviation airports equipped to handle these aircraft and the possibility that, if the South Airport runway ever does approach capacity, there could be pressure to allow business jets to use the North Field. (It is entirely possible, of course, that at such a point the North Field would itself be used at or near capacity.) In the East Bay area the only general aviation airport within 15 miles of the Oakland Airport is the Hayward Air Terminal, 6 miles southeast. Not only is the Hayward Terminal less equipped for jet traffic and nearer its capacity at present, but the safety and noise impacts of jet use at this facility could significantly affect nearby residential and commercial development.

¹The boarding factor = daily emplanements
seats per day

²The Wyle Report assumes an assignment of 50% of the jets to North Field Runway 27R/9L and 50% to 27L/9R. By contrast, the configuration of the ALUC line of demarcation seems to indicate that jets are assumed to use 27L/9R only, thus reducing the noise impact area somewhat.

³Settlement Agreement, p. 25.

The question of availability of general aviation airports and business jet facilities on a regional scale is properly the concern of the Metropolitan Transportation Agency and Association of Bay Area Governments in the Regional Transportation Plan, now being updated. Currently the Plan mentions only that the Oakland North Field is "regionally significant"; the update may elaborate on this position in such a way as to help the ALUC evaluate the long-range role of the North Field.

4. Future Noise Impact from Airport Approaches

The foregoing discussion has concentrated almost exclusively on noise impacts in areas affected by departures from the North and South Airports because of current and potential future noise problems in these areas. By contrast, the noise from approaches to runways 27 and 29 is much less problematic now and is not anticipated to affect noise-sensitive areas in the future.

Fewer studies have been done on approach-track noise than on departures and the only recent source for noise projections at the San Leandro/Oakland/Hayward end of the airport runways is the Bolt, Baranek and Newman (BBN) material included in the Draft Environmental Impact Report for the Airport Master Plan.¹ While these contours do not represent assumptions altogether comparable to those of the Wyle report, in combination with the BBN "current" contours they do offer some idea of the range of noise impact south of the Airport. The Port's forecast for 4 MAP is used by the cities of San Leandro and Hayward in their noise elements.

Several factors reduce the likelihood of a noise problem in the approach paths for the Oakland Airport. In the first place, the approach to runway 29 is largely over water. Where lands are included, the uses such as open space, recreation, industrial, are generally not so noise sensitive that a 65-70 dB CNEL would be critical. According to the plans of the communities affected, the future uses would also be compatible.² A second consideration is the fact that retrofit of the JT8D engines would significantly reduce approach noise (whereas departure noise reduction is minimal).

Also, use of the North Field for business jets is not as critical a question in the approach paths as in the departures. Nearby uses are presently low population density open space/recreation and industrial, rendering both noise and safety impacts less severe. It should also be pointed out that the proximity of the Nimitz Freeway raises the ambient noise level, making aircraft noise less obtrusive.³

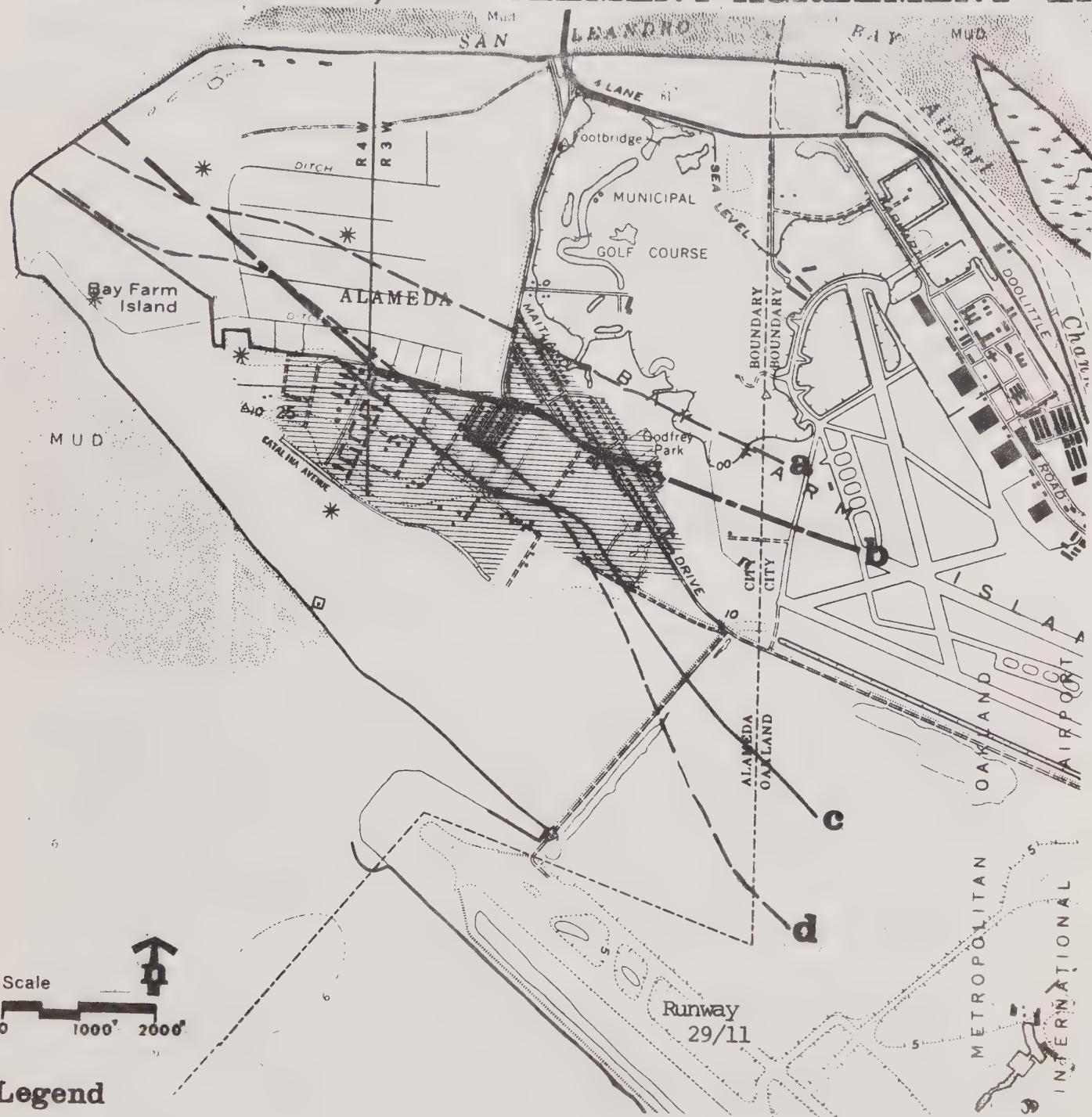
The lands within existing and projected 65+ dB CNEL contours are under Oakland and San Leandro jurisdiction and are expected to continue in noise-compatible uses.

¹Airport Master Plan Draft Environmental Impact Report, p. D-32. The contours are for 4 MAP/1981. Assignment of business jets to the North Field for both landings and take-offs is now outdated.

²See ALUC Background Report "Policies from Other Jurisdictions," October 1976.

³San Leandro Noise Element, "Composite Noise" Map 3.

MOIA NOISE CONTOURS*, LINE OF DEMARCATON, SETTLEMENT AGREEMENT LINE



Legend

- a** 65 dB CNEL Forecast 7.5 M.A.P. jets on runway 27, all aircraft meet FAR 36. *
- b** ALUC Line of Demarcation
- c** Settlement Agreement Line
- d** 65dB CNEL Forecast. 7.5 M.A.P. no jets on runway 27, all aircraft meet FAR 36. *

* Fixed points for CNEL calculations (see Appendix F, table 4.1)

◇ Port of Oakland noise monitoring stations

===== Developed Areas

* Source: Wyle Labs, CNEL Contours For MOIA, 1976

*Not normalized

APPENDIX D

NOISE PROBLEM DECLARATION AT OAKLAND INTERNATIONAL AIRPORT

Based on the California aircraft noise standards¹ provision that a county may require noise monitoring by an airport deemed to have a "noise problem", the Alameda County Board of Supervisors adopted Resolution 144246 in June 1972 declaring the existence of a noise problem at the Oakland International Airport. In accordance with State Division of Aeronautics standards, the airport now performs quarterly monitoring of noise produced by aircraft using South Airport runway 29 and computes quarterly and average annual CNEL's at the two monitoring sites, located near the southern shoreline of Bay Farm Island (see Map XV).

The petition to declare a noise problem at Oakland Airport was first brought before the Board of Supervisors by the City of Alameda and Utah International, Inc., in April 1972. The airport, described in the petition as a commercial and general aviation facility, was alleged to have a "noise impact area" exposing some Bay Farm Island residents to 70 dB CNEL or higher and to have a history of noise complaints. As prescribed by the state standards, the Board of Supervisors referred the petition to the Airport Land Use Commission for its recommendations.

At its May 1972 meeting the Airport Land Use Commission considered the arguments and evidence concerning Oakland Airport noise and recommended to the Board of Supervisors that the airport be found to have a noise problem.² The Board acted accordingly.

The required noise monitoring, begun in April 1973, deals only with the alleged CNEL noise impact from the South Airport, despite the fact that the initial petition and some of the noise complaints considered by the ALUC and the Board referred to North Field as well as South Airport operations. However, since the time of noise problem declaration the Port of Oakland has instituted North Field noise abatement measures--primarily by prohibiting use of the 27 runway complex by turbojets, turbofans, turboprops exceeding 12,500 pounds gross weight, and four engine reciprocating engine aircraft.

The Port of Oakland is responsible for carrying out the monitoring required by the noise problem declaration. Reports giving quarterly and annual CNEL's at the two monitoring sites, as well as total aircraft operations, are submitted regularly to the County and the state Division of Aeronautics. CNEL's at Site 1 have ranged between approximately 75 and 79 dB, at Site 2, between 72.5 and 75; the annual average CNEL for the period of June 1975 to June 1976 was 75.61 at Site 1 and 73.95 at Site 2. With these sites well south of built areas on Bay Farm Island, this information establishes that no residential areas on the Island have been exposed to Oakland South Airport current criterion level CNEL of 75 dB³ and suggests that the South Airport 70 CNEL lies south of existing residences.

1 California Administrative Code, Title 4, Subchapter 6.

2 Airport Land Use Commission Resolution 6, May 10, 1972.

3 Airport Noise Standards, Section 5012.

APPENDIX E

BOARD OF PORT COMMISSIONERS
CITY OF OAKLAND

RESOLUTION NO. 23150

RESOLUTION ESTABLISHING THE POLICY OF THE
BOARD OF PORT COMMISSIONERS WITH RESPECT
TO THE USE OF RUNWAYS AT METROPOLITAN
OAKLAND INTERNATIONAL AIRPORT

RESOLVED that the following is established as the policy of the Board of Port Commissioners with respect to the use of runways at Metropolitan Oakland International Airport:

1. Turbojet and turbofan powered aircraft, turboprop powered aircraft with a certificated gross take-off weight in excess of 12,500 pounds and all four engine reciprocating engine powered aircraft shall be prohibited from either taking off from Runways 27R and 27L or landing on Runways 9L and 9R.
2. The aircraft specified in Paragraph 1 of this resolution shall use Runway 11/29.

3. The requirements of Paragraphs 1 and 2 of this resolution shall not be applicable or effective in emergency situations or whenever Runway 11/29 is closed for maintenance or construction or for reasons of safety; and be it

FURTHER RESOLVED that this resolution shall take effect March 18, 1976.

At a regular meeting held March 17, 1976

Passed by the following vote:

AYES: Commissioners Berkley, Connolly, Gainor, Lange, Walters and President Mortensen - 6

NOES: None

ABSENT: Commissioner Soda - 1

APPENDIX F

MODEL AIRPORT HAZARD ZONING ORDINANCE



AC NO: 150/5190-3A

DATE: 19 Sep 72

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

SUBJECT: MODEL AIRPORT HAZARD ZONING ORDINANCE

1. **PURPOSE.** This advisory circular provides a model airport hazard zoning ordinance for airports. The model ordinance is intended merely as a guide to control manmade and natural hazards to aircraft and will require modifications and revisions to meet the varying circumstances and the state and local laws. This advisory circular does not pre-empt the requirements in Part 77 of the Federal Aviation Regulations.
2. **CANCELLATION.** AC 150/5190-3, Model Airport Zoning Ordinance, dated 16 January 1967.
3. **REFERENCES.**
 - a. The following FAA publications may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Make check or money order payable to the Superintendent of Documents; no c.o.d. orders are accepted.
 - (1) Federal Aviation Regulations (FAR), Volume XI, Part 77, Objects Affecting Navigable Airspace (\$2.75).
 - (2) AC 150/5070-5, Planning the Metropolitan Airport System (\$1.25).
 - (3) AC 150/5070-6, Airport Master Plans (\$1.25).
 - (4) AC 150/5390-1A, Heliport Design Guide (\$0.75).
 - b. Obtain copies of the following publications and additional copies of this advisory circular from the Department of Transportation, Distribution Unit, TAD-484.3, Washington, D. C. 20590.

Initiated by: AAS-560

- (1) AC 70/7460-1A, Obstruction Marking and Lighting
- (2) AC 150/5050-3, Announcement of a Report Entitled Planning the State Airport System.
- (3) AC 150/5300-8, Planning and Design Criteria for Metropolitan STOL Ports.

4. BACKGROUND.

- a. The purpose of airport hazard zoning is to prevent the creation or establishment of structures or objects of natural growth which would constitute hazards or obstructions to aircraft operating to, from, and in the vicinity of an airport. An airport zoning ordinance can be an effective means of controlling the height of structures and objects of natural growth and of generally attaining compatibility in the use of property in the immediate vicinity of the airport.
- b. The standards established in FAR Part 77 make it possible to determine, for any location on or adjacent to an airport, the height above which any structure or growth would constitute an obstruction to air navigation.
- c. The Airport and Airway Development Act of 1970, Public Law 91-258, enacted 21 May 1970, requires airport planning to be consistent with other plans for the development of the area in which the airport is located if Federal aid for the airport is involved. It also requires that appropriate action, including the adoption of zoning laws, be taken to the extent reasonable to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations.
- d. The enclosed Model Ordinance may be used as a guide in preparing a zoning ordinance which protects the airspace described in FAR Part 77, AC 150/5300-8, and AC 150/5390-1A. This Model is a revised version of the original Model Zoning Ordinance dated 7 November 1944.

5. USE OF MODEL ZONING ORDINANCE.

- a. An airport hazard zoning ordinance must conform to the prescribed authority of the particular airport zoning enabling act.
- b. The Model Ordinance defines and provides for the establishment of various zones and prescribes height limitations for each zone as required to protect the airport from encroachment of obstructions or hazards to aircraft. The areas covered by these zones will vary

from airport to airport depending upon the type, size, and layout of the airport, the type of aircraft using the airport, the elevation of the landing area above sea level, and the nature of the surrounding terrain. The Model Ordinance, therefore, leaves the specific zone measurements to be inserted by the political subdivisions adopting the Ordinance to suit the requirements of its particular airport.

- c. Any height limitations imposed by an airport hazard zoning ordinance must be "reasonable," meaning that the height limitations prescribed should not be so low at any point as to constitute a taking of property without compensation. Therefore, the zoning ordinance should not purport to impose height limitations in any area where the approach slope is so close to the ground that the application of criteria prescribed by FAR Part 77 would result in unreasonable or unduly restrictive height limitations. This problem is taken care of in the Model Zoning Ordinance by the establishment of an "excepted height limitation."
- d. The decision as to the excepted height limits to be applied or the distances from the airport at which the height limitations shall commence is one which should be made on the basis of local conditions and circumstances, including the uses being made of property in the vicinity of the airport. In making such a decision, the political subdivision should use the same procedures generally recognized as desirable in preparing comprehensive zoning ordinances.
- e. Areas in the various zones where the applicable height limit is below the excepted height limit prescribed in the ordinance should be protected by the acquisition of title or of a property interest sufficient to insure the required protection.
- f. The FAA personnel in regional and district offices should be consulted when developing airport zoning regulations as applicable to FAR Part 77, AC 150/5390-1A, and AC 150/5300-8.

6. AIRPORT HAZARD ZONING MAP.

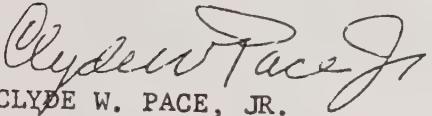
- a. Attached to the airport hazard zoning ordinance and made a part thereof is an airport hazard zoning map. The airport hazard zoning map is similar for CTOL (Conventional Take Off Landing) airports, STOL (Short Take Off Landing) ports, and heliports and may be compiled from data in FAR Part 77, AC 150/5390-1A, and AC 150/5300-8. A typical example of the airport hazard zoning map was reduced in size for printing on the last page of this publication.

- b. The airport hazard zoning map is of the area affected by the airport hazard zoning ordinance and shows the layout of the runways, the airport boundaries, the airport elevation, and the area topography. The map also sets forth the various zones with the applicable height limitations for each as described in the body of the ordinance. The zoning map should contain a method of land identification, as typical in different areas of the country, such as section, township and range, block and lot, or metes and bounds. This map also depicts other identifying geographic objects such as streams, rivers, railroads, roads, and streets. By using a map with this amount of detail, in conjunction with the text of an ordinance, a property owner should, without undue difficulty, be able to determine not only the location of his property but also the height limitations imposed thereon by the ordinance.
- c. Topographic maps of sufficient accuracy and detail may be available from local governmental sources. Suitable topographic maps (Quadrangle maps) may be obtained from the Washington Distribution Section, United States Geological Survey, 1200 South Eads Street, Arlington, Virginia 22202, and the Denver Distribution Section, United States Geological Survey, Federal Center, Denver, Colorado 80225, for those people living east and west of the Mississippi River, respectively. This agency has developed such maps for a large area throughout the country. Many state agencies have topographic maps available. In the absence of contour topographic data, land height source data may be available from bench marks, railroads, highways, or local project surveys. However, contour data on a map should be shown to the extent it is reasonably available and obtainable or required to legally support the ordinance.

7. BOARD OF ADJUSTMENT. The Model Ordinance provides for the creation of a Board of Adjustment to hear appeals from decisions of the municipal official designated to receive applications and issue permits and also provides for judicial review of decisions of the Board of Adjustment. Such review and appeal procedures are intended to conform to the applicable constitutional requirements.

8. GENERAL INSTRUCTIONS FOR USING THE ENCLOSED ZONING ORDINANCE. The enclosed zoning ordinance may be used as a guide for CTOL airports, STOL ports, heliports, or any combination thereof. The blank spaces will be filled in with the appropriate specific instructions shown in Appendix 1, pages 14 and 15. The general instructions emphasize using portions of the enclosed zoning ordinance that apply for a specific airport. The general instructions are as follows:

- a. The zoning ordinance will be renumbered as material is deleted and/or added.
- b. Material prior to Section I and Section I are satisfactory for any airport type or types.
- c. Section II should only define the terms applicable for the specific airport zoning ordinance.
- d. Section III should only include the airport zones applicable for the specific airport. Zones in items 1 through 6, 10, 14, and 15 are for CTOL runways. An approach zone is applied to each end of each runway based upon the type of approach available or planned for that runway end. The most precise type of approach, existing or planned, for either end of the runway determines the primary surface width. Heliports do not have horizontal or conical zones, and STOL ports do not have immediately available criteria for horizontal or conical zones. Zones in items 7, 8, 11, and 12 are for heliports. Zones in items 9 and 13 are for STOL runways.
- e. Section IV should only include the applicable height limitations for the airport zones used in Section III for a specific airport.
- f. Sections V through XV are satisfactory for any airport type or types.



CLYDE W. PACE, JR.
Acting Director, Airports Service

AIRPORT HAZARD ZONING ORDINANCE

(See Instruction #1, Page 14)

AN ORDINANCE REGULATING AND RESTRICTING THE HEIGHT OF STRUCTURES AND OBJECTS OF NATURAL GROWTH, AND OTHERWISE REGULATING THE USE OF PROPERTY, IN THE VICINITY OF THE (See Instruction #1, page 14) BY CREATING THE APPROPRIATE ZONES AND ESTABLISHING THE BOUNDARIES THEREOF; PROVIDING FOR CHANGES IN THE RESTRICTIONS AND BOUNDARIES OF SUCH ZONES; DEFINING CERTAIN TERMS USED HEREIN; REFERRING TO THE (See Instruction #1, page 14) ZONING MAP WHICH IS INCORPORATED IN AND MADE A PART OF THIS ORDINANCE; PROVIDING FOR ENFORCEMENT; ESTABLISHING A BOARD OF ADJUSTMENT; AND IMPOSING PENALTIES. (See Instruction #2, page 14).

This Ordinance is adopted pursuant to the authority conferred by (See Instruction #3, page 14). It is hereby found that an airport hazard endangers the lives and property of users of (See Instruction #1, page 14), and property or occupants of land in its vicinity, and also if the obstruction type, in effect reduces the size of the area available for the landing, takeoff, and maneuvering of aircraft, thus tending to destroy or impair the utility of (See Instruction #1, page 14) and the public investment therein. Accordingly, it is declared:

- (1) that the creation or establishment of an airport hazard is a public nuisance and an injury to the region served by (See Instruction #1, page 14) .
- (2) that it is necessary in the interest of the public health, public safety, and general welfare (See Instruction #4, page 14) that the creation or establishment of airport hazards be prevented; and
- (3) that the prevention of these hazards should be accomplished, to the extent legally possible, by the exercise of the police power without compensation.

It is further declared that both the prevention of the creation or establishment of airport hazards and the elimination, removal, alteration, mitigation, or marking and lighting of existing airport hazards are public purposes for which political subdivision may raise and expend public funds and acquire land or interests in land.

IT IS HEREBY ORDAINED BY (See Instruction #5, page 14) as follows:

SECTION I: SHORT TITLE

This Ordinance shall be known and may be cited as "(See Instruction #1, page 14) Hazard Zoning Ordinance."

SECTION II: DEFINITIONS

As used in this Ordinance, unless the context otherwise requires:

- (1) AIRPORT - The (See Instruction #1, page 14).
- (2) AIRPORT ELEVATION - The highest point of an airport's usable landing area measured in feet from mean sea level.
- (3) AIRPORT HAZARD - Any structure or object of natural growth located on or in the vicinity of a public airport, or any use of land near such airport, which obstructs the airspace required for the flight of aircraft in landing or takeoff at such airport or is otherwise hazardous to such landing or takeoff of aircraft.
- (4) STRUCTURE - An object constructed or installed by man, including, but without limitation, buildings, towers, smokestacks, earth formation, and overhead transmission lines.
- (5) TREE - Any object of natural growth.
- (6) NONCONFORMING USE - Any pre-existing structure, object of natural growth, or use of land which is inconsistent with the provisions of this Ordinance or an amendment thereto.
- (7) HEIGHT - For the purpose of determining the height limits in all zones set forth in this Ordinance and shown on the zoning map, the datum shall be mean sea level elevation unless otherwise specified.
- (8) PERSON - An individual, firm, partnership, corporation, company, association, joint stock association, or governmental entity. It includes a trustee, receiver, assignee, or similar representative of any of them.
- (9) BOARD OF ADJUSTMENT - A board consisting of (See Instruction #6, page 14) members appointed by the (See Instruction #6, page 14) as provided in (See Instruction #6, page 14).
- (10) RUNWAY - A defined area on an airport prepared for landing and takeoff of aircraft along its length.

- (11) VISUAL RUNWAY - A runway intended solely for the operation of aircraft using visual approach procedures with no straight-in instrument approach procedure and no instrument designation indicated on an FAA approved airport layout plan, a military service's approved military airport layout plan, or by any planning document submitted to the FAA by competent authority.
- (12) UTILITY RUNWAY - A runway that is constructed for and intended to be used by propeller driven aircraft of 12,500 pounds maximum gross weight and less.
- (13) NON-PRECISION INSTRUMENT RUNWAY - A runway having an existing instrument approach procedure utilizing air navigation facilities with only horizontal guidance, or area type navigation equipment, for which a straight-in non-precision instrument approach procedure has been approved or planned, and for which no precision approach facilities are planned or indicated on an FAA planning document or military service's military airport planning document.
- (14) PRECISION INSTRUMENT RUNWAY - A runway having an existing instrument approach procedure utilizing an Instrument Landing System (ILS) or a Precision Approach Radar (PAR). It also means a runway for which a precision approach system is planned and is so indicated on an FAA approved airport layout plan; a military service's approved military airport layout plan; any other FAA planning document, or military service's military airport planning document.
- (15) PRIMARY SURFACE - A surface longitudinally centered on a runway. When the runway has a specially prepared hard surface, the primary surface extends 200 feet beyond each end of that runway; but when the runway has no specially prepared hard surface, or planned hard surface, the primary surface ends at each end of that runway. The width of the primary surface of a runway will be that width prescribed in Part 77 of the Federal Aviation Regulations (FAR) for the most precise approach existing or planned for either end of that runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.
- (16) HELIPORT PRIMARY SURFACE - The area of the primary surface coincides in size and shape with the designated landing and takeoff area of a heliport (runway). This surface is a horizontal plane at the elevation of the established heliport elevation.

(17) STOL PRIMARY SURFACE - An imaginary plane, 300 feet wide, centered on the runway. Its length extends 100 feet beyond each runway end. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.

(18) APPROACH, TRANSITIONAL, HORIZONTAL, AND CONICAL ZONES - These zones apply to the area under the approach, transitional, horizontal, and conical surfaces defined in (See Instruction #7, page 14).

SECTION III: AIRPORT ZONES

In order to carry out the provisions of this Ordinance, there are hereby created and established certain zones which include all of the land lying within the approach zones, transitional zones, horizontal zones, and conical zones as they apply to a particular airport. Such zones are shown on (See Instruction #1, page 14) Hazard Zoning Map consisting of sheets, prepared by , and dated 19 , which is attached to this Ordinance and made a part hereof. An area located in more than one (1) of the following zones is considered to be only in the zone with the more restrictive height limitation. The various zones are hereby established and defined as follows:

1. Utility Runway Visual Approach Zone - The inner edge of this approach zone coincides with the width of the primary surface and is (See Instruction #8, page 14) feet wide. The approach zone expands outward uniformly to a width of 1,250 feet at a horizontal distance of 5,000 feet from the primary surface. Its centerline being the continuation of the centerline of the runway.
2. Utility Runway Non-Precision Instrument Approach Zone - The inner edge of this approach zone coincides with the width of the primary surface and is (See Instruction #8, page 14) feet wide. The approach zone expands outward uniformly to a width of 2,000 feet at a horizontal distance 5,000 feet from the primary surface. Its centerline being the continuation of the centerline of the runway.
3. Runway Larger Than Utility Visual Approach Zone - The inner edge of this approach zone coincides with the width of the primary surface and is (See Instruction #8, page 14) feet wide. The approach zone expands outward uniformly to a width of 1,500 feet at a horizontal distance of 5,000 feet from the primary surface. Its centerline being the continuation of the centerline of the runway.

4. Runway Larger Than Utility With a Visibility Minimum Greater Than 3/4 Mile Non-Precision Instrument Approach Zone - The inner edge of this approach zone coincides with the width of the primary surface and is (See Instruction #8, page 14) feet wide. The approach zone expands outward uniformly to a width of 3,500 feet at a horizontal distance of 10,000 feet from the primary surface. Its centerline being the continuation of the centerline of the runway.
5. Runway Larger Than Utility With a Visibility Minimum As Low As 3/4 Mile Non-Precision Instrument Approach Zone - The inner edge of this approach zone coincides with the width of the primary surface and is 1,000 feet wide. The approach zone expands outward uniformly to a width of 4,000 feet at a horizontal distance of 10,000 feet from the primary surface. Its centerline being the continuation of the centerline of the runway.
6. Precision Instrument Runway Approach Zone - The inner edge of this approach zone coincides with the width of the primary surface and is 1,000 feet wide. The approach zone expands outward uniformly to a width of 16,000 feet at a horizontal distance of 50,000 feet from the primary surface. Its centerline being the continuation of the centerline of the runway.
7. Heliport Visual Flight Rules (VFR) Approach Zone - The inner edge of this approach zone coincides with the width of the primary surface and is (See Instruction #9, page 14) feet wide. The approach zone expands outward uniformly to a width of 500 feet at a horizontal distance of 4,000 feet from the primary surface. Its centerline being the continuation of the centerline of the primary surface.
8. Heliport Instrument Flight Rules (IFR) Approach Zone - The inner edge of this approach zone coincides with the width of the primary surface and is 300 feet wide. The approach zone expands outward uniformly to a width of 3,400 feet at a horizontal distance of 10,000 feet from the primary surface. Its centerline being the continuation of the centerline of the primary surface.
9. STOL Precision Instrument Approach Zone - The inner edge of this approach zone coincides with the primary surface and is 300 feet wide. The approach zone expands outward uniformly to a width of 3,400 feet at a horizontal distance of 10,000 feet from the primary surface. Its centerline being the continuation of the centerline of the runway.
10. Transitional Zones. - These zones are hereby established as the area beneath the transitional surfaces. These surfaces extend outward and upward at 90 degree angles to the runway centerline and the runway

centerline extended at a slope of seven (7) feet horizontally for each foot vertically from the sides of the primary and approach surfaces to where they intersect the horizontal and conical surfaces. Transitional zones for those portions of the precision approach zones which project through and beyond the limits of the conical surface, extend a distance of 5,000 feet measured horizontally from the edge of the approach zones and at 90 degree angles to the extended runway centerline.

11. Heliport VFR Transitional Zones - These zones extend outward from the sides of the primary surface and the approach zones a horizontal distance of 250 feet from the primary surface centerline and the extended primary surface centerline.
12. Heliport IFR Transitional Zones - These zones extend outward from the sides of the primary surface and a portion of the sides of the approach zones a horizontal distance of 350 feet from the primary surface centerline and the extended primary surface centerline.
13. STOL Precision Instrument Transitional Zones - These zones extend outward from the sides of the primary surfaces a horizontal distance of 400 feet and from a portion of the sides of the approach zones a variable horizontal distance of 400 feet at the primary surface end to zero feet at a horizontal distance of 1,500 feet measured outward along the extended primary surface centerline.
14. Horizontal Zone - The horizontal zone is hereby established by swinging arcs of (See Instruction #10, page 14) feet radii from the center of each end of the primary surface of each runway, and connecting the adjacent arcs by drawing lines tangent to those arcs. The horizontal zone does not include the approach and transitional zones.
15. Conical Zone - The conical zone is hereby established as the area that commences at the periphery of the horizontal zone and extends outward therefrom a horizontal distance of 4,000 feet. The conical zone does not include the precision instrument approach zones and the transitional zones.

SECTION IV: AIRPORT ZONE HEIGHT LIMITATIONS

Except as otherwise provided in this Ordinance, no structure or tree shall be erected, altered, allowed to grow, or be maintained in any zone created by this Ordinance to a height in excess of the applicable height limit herein established for such zone. Such applicable height limitations are hereby established for each of the zones in question as follows:

1. Utility Runway Visual Approach Zone - Slopes upward twenty (20) feet horizontally for each foot vertically, beginning at the end of and at the same elevation as the primary surface and extending to a horizontal distance of 5,000 feet along the extended runway centerline.
2. Utility Runway Non-Precision Instrument Approach Zone - Slopes upward twenty (20) feet horizontally for each foot vertically beginning at the end of and at the same elevation as the primary surface and extending to a horizontal distance of 5,000 feet along the extended runway centerline.
3. Runway Larger Than Utility Visual Approach Zone - Slopes upward twenty (20) feet horizontally for each foot vertically beginning at the end of and at the same elevation as the primary surface and extending to a horizontal distance of 5,000 feet along the extended runway centerline.
4. Runway Larger Than Utility With A Visibility Minimum Greater Than 3/4 Mile Non-Precision Instrument Approach Zone - Slopes upward thirty-four (34) feet horizontally for each foot vertically beginning at the end of and at the same elevation as the primary surface and extending to a horizontal distance of 10,000 feet along the extended runway centerline.
5. Runway Larger Than Utility With a Visibility Minimum As Low As 3/4 Mile Non-Precision Instrument Approach Zone - Slopes upward thirty-four (34) feet horizontally for each foot vertically beginning at the end of and at the same elevation as the primary surface and extending to a horizontal distance of 10,000 feet along the extended runway centerline.
6. Precision Instrument Runway Approach Zone - Slopes upward fifty (50) feet horizontally for each foot vertically beginning at the end of and at the same elevation as the primary surface and extending to a horizontal distance of 10,000 feet along the extended runway centerline; thence slopes upward forty (40) feet horizontally for each foot vertically to an additional horizontal distance of 40,000 feet along the extended runway centerline.
7. Heliport VFR Approach Zones - Slopes upward eight (8) feet horizontally for each foot vertically beginning at the end of and at the same elevation as the primary surface and extending to a distance of 4,000 feet along the extended primary surface centerline.
8. Heliport IFR Approach Zones - Slopes upward fifteen (15) feet horizontally for each foot vertically beginning at the end of and at the same elevation as the primary surface, and extending to a distance of 10,000 feet along the extended primary surface centerline.

9. STOL Approach Zones - Slopes upward fifteen (15) feet horizontally for each foot vertically beginning at the end of and at the same elevation as the primary surface, and extending to a distance of 10,000 feet along the extended runway centerline.
10. Transitional Zones - Slopes upward and outward seven (7) feet horizontally for each foot vertically beginning at the sides of and at the same elevation as the primary surface and the approach zones, and extending to a height of 150 feet above the airport elevation which is _____ feet above mean sea level. In addition to the foregoing, there are established height limits sloping upward and outward seven (7) feet horizontally for each foot vertically beginning at the sides of and at the same elevation as the approach zones, and extending to where they intersect the conical surface. Where the precision instrument runway approach zone projects beyond the conical zone, height limits sloping upward and outward seven (7) feet horizontally for each foot vertically shall be maintained beginning at the sides of and at the same elevation as precision instrument runway approach surface, and extending to a horizontal distance of 5,000 feet measured at 90 degree angles to the extended runway centerline.
11. Heliport VFR Transitional Zones - Slopes upward and outward two (2) feet horizontally for each foot vertically beginning at the sides of and at the same elevation as the primary surface and the approach surfaces, and extending a distance of 250 feet measured horizontally from and at 90 degree angles to the primary surface centerline and extended centerline.
12. Heliport IFR Transitional Zones - Slopes upward and outward four (4) feet horizontally for each foot vertically beginning at the sides of and at the same elevation as the primary surface and a portion of the sides of the approach surface and extending a distance of 350 feet measured horizontally from and at 90 degree angles to the primary surface centerline and extended centerline.
13. STOL Transitional Zones - Slopes upward and outward four (4) feet horizontally for each foot vertically beginning at the sides of and at the same elevation as the primary surface and a portion of the sides of the approach surface and extends to an elevation of 100 feet above the primary surface.
14. Horizontal Zone - One hundred and fifty (150) feet above the airport elevation or a height of _____ feet above mean sea level.

15. Conical Zone - Slopes upward and outward twenty (20) feet horizontally for each foot vertically beginning at the periphery of the horizontal zone and at one hundred and fifty (150) feet above the airport elevation and extending to a height of 350 feet above the airport elevation.
16. Excepted Height Limitations - Nothing in this Ordinance shall be construed as prohibiting the growth, construction, or maintenance of any tree or structure to a height up to (See Instruction #11, page 14) feet above the surface of the land.

Where an area is covered by more than one (1) height limitation, the more restrictive limitation shall prevail.

SECTION V: USE RESTRICTIONS

Notwithstanding any other provisions of this Ordinance, no use may be made of land or water within any zone established by this Ordinance in such a manner as to create electrical interference with navigational signals or radio communication between the airport and aircraft, make it difficult for pilots to distinguish between airport lights and others, result in glare in the eyes of pilots using the airport, impair visibility in the vicinity of the airport or otherwise in any way create a hazard or endanger the landing, takeoff, or maneuvering of aircraft intending to use the airport.

SECTION VI. NONCONFORMING USES

1. Regulations not Retroactive - The regulations prescribed by this Ordinance shall not be construed to require the removal, lowering, or other changes or alteration of any structure or tree not conforming to the regulations as of the effective date of this Ordinance, or otherwise interfere with the continuance of a nonconforming use. Nothing contained herein shall require any change in the construction, alteration, or intended use of any structure, the construction or alteration of which was begun prior to the effective date of this Ordinance, and is diligently prosecuted.
2. Marking and Lighting - Notwithstanding the preceding provision of this Section, the owner of any existing nonconforming structure or tree is hereby required to permit the installation, operation, and maintenance thereon of such markers and lights as shall be deemed necessary by the (See Instruction #12, page 15) to indicate to the operators of aircraft in the vicinity of the airport, the presence of such airport hazards. Such markers and lights shall be installed, operated, and maintained at the expense of (See Instruction #13, page 15).

SECTION VII: PERMITS

1. Future Uses - No material change shall be made in the use of land and no structure or tree shall be erected, altered, planted, or otherwise established in any zone hereby created unless a permit therefor shall have been applied for and granted.
 - (a) However, a permit for a tree or structure of less than 75 feet of vertical height above the ground shall not be required in the horizontal and conical zones or in any approach and transitional zones beyond a horizontal distance of 4,200 feet from each end of the runway except when such tree or structure, because of terrain, land contour, or topographic features, would extend above the height limit prescribed for the respective zone.
 - (b) Each application for a permit shall indicate the purpose for which the permit is desired with sufficient particulars to determine whether the resulting use, structure, or tree would conform to the regulations herein prescribed. If such determination is in the affirmative, the permit shall be granted.
2. Existing Uses - No permit shall be granted that would allow the establishment or creation of an airport hazard or permit a nonconforming use, structure, or tree to become a greater hazard to air navigation than it was on the effective date of this Ordinance or any amendments thereto or than it is when the application for a permit is made. Except as indicated, all applications for such a permit shall be granted.
3. Nonconforming Uses Abandoned or Destroyed - Whenever the (See Instruction #14, page 15) determines that a nonconforming tree or structure has been abandoned or more than 80 percent torn down, physically deteriorated, or decayed, no permit shall be granted that would allow such structure or tree to exceed the applicable height limit or otherwise deviate from the zoning regulations.
4. Variances - Any person desiring to erect or increase the height of any structure, or permit the growth of any tree, or use his property not in accordance with the regulations prescribed in this Ordinance, may apply to the Board of Adjustment for a variance from such regulations. Such variances shall be allowed where it is duly found that a literal application or enforcement of the regulations would result in practical difficulty or unnecessary hardship and relief granted would not be contrary to the public interest but will do substantial justice and be in accordance with the spirit of this Ordinance.

5. HAZARD MARKING AND LIGHTING - Any permit or variance granted may, if such action is deemed advisable to effectuate the purpose of this Ordinance and be reasonable in the circumstances, be so conditioned as to require the owner of the structure or tree in question to permit the (See Instruction #13, page 15), at its own expense, to install, operate, and maintain thereon such markers and lights as may be necessary to indicate to pilots the presence of an airport hazard.

SECTION VIII: ENFORCEMENT

It shall be the duty of the (See Instruction #15, page 15) to administer and enforce the regulations prescribed herein. Applications for permits and variances shall be made to the (See Instruction #15, page 15) upon a form furnished by him. Applications required by this Ordinance to be submitted to the (See Instruction #15, page 15) shall be promptly considered and granted or denied by him. Application for action by the Board of Adjustment shall be forthwith transmitted by the (See Instruction #15, page 15).

SECTION IX: BOARD OF ADJUSTMENT

1. There is hereby created a Board of Adjustment to have and exercise the following powers: (1) to hear and decide appeals from any order, requirement, decision, or determination made by the (See Instruction #15, page 15) in the enforcement of this Ordinance; (2) to hear and decide special exceptions to the terms of this Ordinance upon which such Board of Adjustment under such regulations may be required to pass; and (3) to hear and decide specific variances.
2. The Board of Adjustment shall consist of ___ members appointed by the (See Instruction #13, page 15) and each shall serve for a term of ___ years and until his successor is duly appointed and qualified. Of the members first appointed, one shall be appointed for a term of ___ year, ___ for a term of ___ years and ___ for a term of ___ years. Members shall be removable by the appointing authority for cause, upon written charges, after a public hearing.
3. The Board of Adjustment shall adopt rules for its governance and in harmony with the provisions of this Ordinance. Meetings of the Board of Adjustment shall be held at the call of the Chairman and at such other times as the Board of Adjustment may determine. The Chairman, or in his absence the acting chairman, may administer oaths and compel the attendance of witnesses. All hearings of the Board of Adjustment shall be public. The Board of Adjustment shall keep minutes of its proceedings showing the vote of each member upon each question; or

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if absent or failing to vote, indicating such fact, and shall keep records of its examinations and other official actions, all of which shall immediately be filed in the office of (See Instruction #15, page 15), and on due cause shown.

4. The Board of Adjustment shall make written findings of facts and conclusions of law giving the facts upon which it acted and its legal conclusions from such facts in reversing, affirming, or modifying any order, requirement, decision, or determination which comes before it under the provisions of this Ordinance.
5. The concurring vote of a majority of the members of the Board of Adjustment shall be sufficient to reverse any order, requirement, decision, or determination of the (See Instruction #15, page 15) or to decide in favor of the applicant on any matter upon which it is required to pass under this Ordinance, or to effect variation in this Ordinance.

SECTION X: APPEALS

1. Any person aggrieved, or any taxpayer affected, by any decision of the (See Instruction #15, page 15) made in his administration of this Ordinance, may appeal to the Board of Adjustment.
2. All appeals hereunder must be taken within a reasonable time as provided by the rules of the Board of Adjustment, by filing with the (See Instruction #15, page 15) a notice of appeal specifying the grounds thereof. (See Instruction #15, page 15) shall forthwith transmit to the Board of Adjustment all the papers constituting the record upon which the action appealed from was taken.
3. An appeal shall stay all proceedings in furtherance of the action appealed from unless the (See Instruction #15, page 15) certifies to the Board of Adjustment, after the notice of appeal has been filed with it, that by reason of the facts stated in the certificate a stay would, in his opinion, cause imminent peril to life or property. In such case, proceedings shall not be stayed except by order of the Board of Adjustment on notice to the (See Instruction #15, page 15), and on due cause shown.
4. The Board of Adjustment shall fix a reasonable time for hearing appeals, give public notice and due notice to the parties in interest, and decide the same within a reasonable time. Upon the hearing, any party may appear in person or by agent or by attorney.

5. The Board of Adjustment may, in conformity with the provision of this Ordinance, reverse or affirm, in whole or in part, or modify the order, requirement, decision, or determination appealed from and may make such order, requirement, decision, or determination, as may be appropriate under the circumstances.

SECTION XI: JUDICIAL REVIEW

Any person aggrieved, or any taxpayer affected, by any decision of the Board of Adjustment, may appeal to the Court of _____ as provided in Section _____ of Chapter _____ of the Public Laws of (See Instruction #16, page 15).

SECTION XII: PENALTIES

Each violation of this Ordinance or of any regulation, order, or ruling promulgated hereunder shall constitute a misdemeanor and be punishable by a fine of not more than _____ dollars or imprisonment for not more than _____ days or both; and each day a violation continues to exist shall constitute a separate offense.

SECTION XIII: CONFLICTING REGULATIONS

Where there exists a conflict between any of the regulations or limitations prescribed in this Ordinance and any other regulations applicable to the same area, whether the conflict be with respect to the height of structures or trees, the use of land, or any other matter, the more stringent limitation or requirement shall govern and prevail.

SECTION XIV: SEVERABILITY

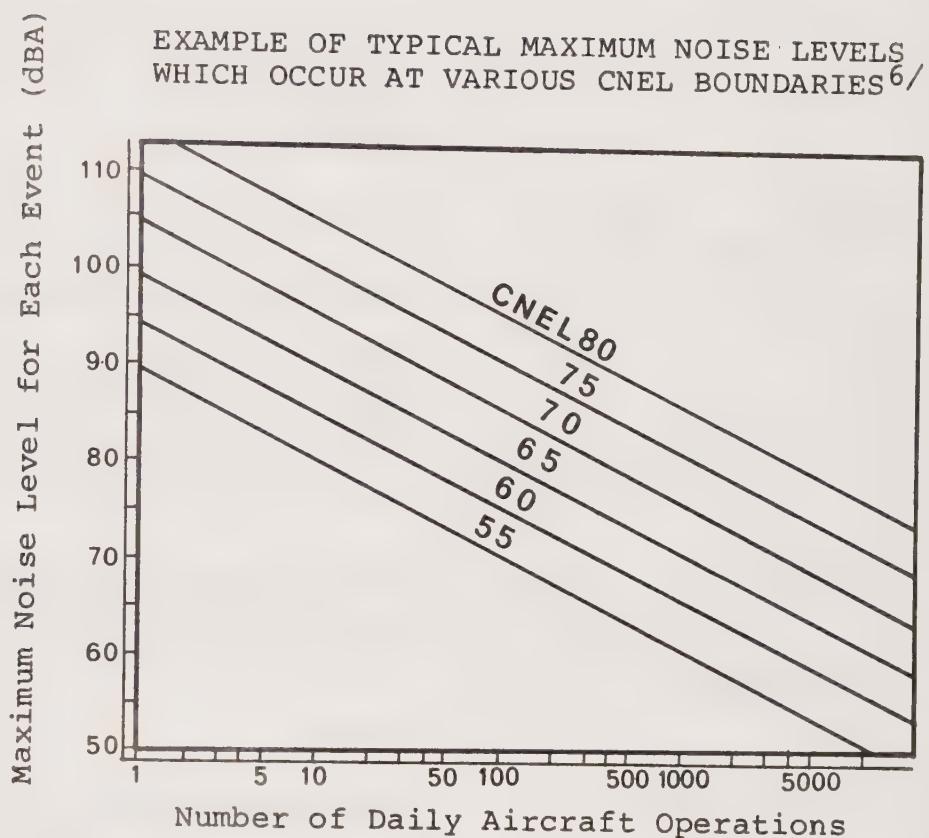
If any of the provisions of this Ordinance or the application thereof to any person or circumstances is held invalid, such invalidity shall not affect other provisions or applications of the Ordinance which can be given effect without the invalid provision or application, and to this end the provisions of this Ordinance are declared to be severable.

SECTION XV: EFFECTIVE DATE

WHEREAS, the immediate operation of the provisions of this Ordinance is necessary for the preservation of the public health, public safety, and general welfare, and EMERGENCY is hereby declared to exist, and this Ordinance shall be in full force and effect from and after its passage by the _____ and publication and posting as required by law.
Adopted by the _____ this _____ day of _____, 19____.

APPENDIX G
AIRCRAFT NOISE AND INSULATION:
TABLES IV - VIII

TABLE IV



NOTES:

1. All aircraft events are assumed to be equally noisy and of equal duration.
2. Aircraft operations time mix used in this example:

Day 70 percent
 Evening 23
 Night 7

Source: "Supporting Information for the Adopted Noise Regulations for California Airports," Final Report to the California Department of Aeronautics, Report No. WCR 70-3 (R), Wyle Laboratories Research Staff, El Segundo, California, January 29, 1971.

TABLE V

RECOMMENDED MAXIMUM INTERIOR NOISE LEVEL
CRITERIA FOR INTERMITTENT NOISE

<u>Generalized Land Use (Occupancy)</u>	<u>Maximum Int. Intermittent Noise - dBA</u>	<u>Basis for Criteria*</u>
A. RESIDENTIAL - SINGLE AND TWO FAMILY DWELLINGS		
1. Living Areas		
a. Daytime	45	Conversation
b. Nighttime	45	Conversation
2. Sleeping Areas	40	Sleeping
B. RESIDENTIAL		
Multiple Family Apartments	Same as A.	Same as A.
C. EDUCATIONAL FACILITIES, ETC.		
1. Concert Hall	25	Intrusion of noise may spoil artistic effect
2. Legitimate Theater	30	" " " "
3. School Auditorium	35	Minimize intrusion into artistic performance
4. School Classroom	55	Speech communication - 20 ft. - raised voice
5. School Laboratory	60	" " - 6 ft. - normal voice
6. Church Sanctuaries	45	" " - 50 ft. - raised voice
7. Library	55	" "
D. RECREATIONAL FACILITIES		
1. Motion Picture Theater	45	Minimize intrusion into artistic performance
2. Sports Arena	75	Conversation - 2 ft. - raised voice
3. Bowling Alley	75	" - 2 ft. - " "
E. COMMERCIAL, MISCELLANEOUS		
1. Hotel, Motel Sleeping	40	Sleeping
2. Hospital Sleeping	40	"
3. Executive Offices, Conf. Rooms	55	Speech communication - 12 ft. - normal voice
4. Staff Offices	60	" " - 6 ft. - normal voice
5. Sales, Secretarial	65	Satisfactory telephone use
6. Restaurants	65	Conversation - 4 ft. - normal voice
7. Markets, Retail Stores	65	" - 4 ft. - normal voice
F. LIGHT INDUSTRIAL		
1. Office Areas	See E-3, 4, 5	See E-3, 4, 5
2. Laboratory	60	Speech Communication - 6 ft. - normal voice
3. Machine Shop	70	" " - 3 ft. - raised voice
4. Assembly, Construction	70	" " - 2 ft. - raised voice

(continued)

Table V continued

G. HEAVY INDUSTRIAL

1. Office Areas	See E-3,4,5	See E-3, 4, 5
2. Machine Shop	75	Speech Communication - 3 ft. - raised voice
3. Assembly, Construction	75	" " 2 ft. - raised voice

*The relationship between noise level expressed in dBA and the ability to communicate is given in reference 16. There may be some exceptions depending upon the type of exposure and the noise reduction frequency characteristics of the exterior building construction.

Adapted from:

J. C. Webster, "SIL--Past, Present and Future," Sound and Vibration, III, 8 (August 1969), 22-26; Paul S. Veneklasen and Assoc., "Noise Insulation Problems in Buildings," January 1973.

Appears in:

Sacramento Regional Area Planning Commission, Airport Land Use Policy Plan, p. 18; Santa Clara County Airport Land Use Planning Commission, Land Use Plan for Area Surrounding Santa Clara County Airports, p. 28-29.

TABLE VI

NOISE REDUCTION AFFORDED BY COMMON BUILDING CONSTRUCTION
ASSUMING NO SPECIAL NOISE CONTROL PROVISIONS

<u>Construction Type</u>	<u>Typical Occupancy</u>	<u>General Description</u>	<u>Range of Noise Reduction, dBA</u>
1	Residential, Commercial, Schools	Wood framing. Exterior stucco or wood sheathing. Interior drywall or plaster. Sliding glass windows. Windows partially open.	15 - 20
2	Same as 1, above	Same as 1 above, but windows closed	25 - 30
3	Commercial, Schools	Same as 1 above, but windows are fixed 1/4 inch plate glass	30 - 35
4	Commercial	Steel or concrete framing. Curtain-wall or masonry exterior wall. Fixed 1/4 inch plate glass windows	30 - 40

The range depends upon the openness of the windows, the degree of seal and the window area involved.

Source:

Bolt, Baranek and Newman, "Methods for Improving the Noise Insulation of Houses with Respect to Aircraft Noise," November 1966.

Paul S. Veneklasen and Assoc., "Aircraft Noise Level Study for the City of Newport Beach, California--1972."

Wyle Laboratories, "Guide to the Soundproofing of Existing Homes Against Exterior Noise," March 1970.

"Noise Insulation Problems in Buildings," Paul S. Veneklasen and Assoc., January 19, 1973.

Used in Santa Clara County and Sacramento Regional Area airport land use plans.

TABLE VII

GENERAL CONSTRUCTION METHODS TO ACHIEVE
THE INDICATED EXTERIOR NOISE REDUCTION

Required Overall Bldg. Noise Reduction(dBA)	FLOOR	CONSTRUCTION BUILDING ELEMENTS			CEILING, ROOF
		EXTERIOR WALLS	EXTERIOR DOORS	WINDOWS	
30	No special provisions	No special provisions, except eliminate penetrations of wall air conditioning units, etc.	Solid core, weatherstripping	Seal	Generally, no special provisions
40	a. Slab on grade-no special provisions b. If raised floor, one or more of the following: 1. vent baffling 2. attach gypsum board to under side of floor joists	No special provisions in most cases. Eliminate penetrations of wall air conditioning units, etc.	Sound doors, sound seals	Double glazing, sealed windows	a. Attic System 1. vent baffling 2. sound absorption between joists b. If beam ceiling: 1. provide sound absorption between beams 2. provide gypsum board on resilient clips to under side of beams
50	a. Slab on grade-no special provisions b. If raised floor: 1. vent baffling 2. provide sound absorption between floor joists 3. add gypsum board to under side of floor joists	a. Wood framing-staggered studs with sound absorption in cavity. Stucco on outside, 2 layers gypsum board on inside. b. 8 in. concrete block with sealed exterior and interior surfaces. c. 4 in. dense concrete	Special sound doors with acoustical seals	Double glazing, sealed windows, minimum 4 in. airspace	a. Attic System 1. vent sound traps 2. independently framed ceiling and roof system 3. sound absorption in attic space b. Built up roof over 4 in. concrete slab with suspended ceiling
60	a. Slab on grade-no special provisions b. If raised floor: similar to NR-50 requirement except more effective vent baffling+attach gypsum board to floor joists by resilient clips	a. Wood or steel stud framing-double studs with multi-layer gypsum board on both sides, exterior stucco or sheathing. Sound absorption in air cavity b. 12 in. dense concrete c. 4 in. concrete with separate furred multi-layer gypsum board wall. Sound absorption in air cavity	Two solid core weatherstripped doors with sound lock	Barely practical. Minimize window area. Double glazing with acoustical glass and 8 in. airspace. Avoid windows on noise exposure side. Arrange windows on interior encl. court, etc.	a. Attic System, similar to NR-50 requirement but more mass b. 4 in. concrete slab with vibration isolated ceiling

TABLE VIII

SUMMARY OF NOISE LEVELS IDENTIFIED BY EPA
AS REQUISITE TO PROTECT PUBLIC HEALTH AND WELFARE
WITH AN ADEQUATE MARGIN OF SAFETY

Effect to be Guarded Against	Maximum Noise Level ¹	Area
Hearing loss ²	$L_{eq}(24) \leq 70$ dBA	All areas
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dBA	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use
	$L_{eq}(24) \leq 55$ dBA	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	$L_{dn} \leq 45$ dBA	Indoor residential areas
	$L_{eq}(24) \leq 45$ dBA	Other indoor areas with human activities such as schools, etc.

¹ Basically, L_{eq24} represents the sound energy averaged over a 24-hour period. L_{dn} is a 24-hour average, obtained by adding 10 dB to sound measurements between 10 p.m. and 7 a.m.

² The hearing loss level identified here represents annual averages of the daily level over a period of forty years.

Source: U. S. Environmental Protection Agency, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety (Washington: March 1974), page 40.

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ALAMEDA COUNTY AIRPORT LAND USE COMMISSION
HAYWARD, CALIFORNIA

RESOLUTION NO. 17 - At meeting of August 10, 1977

Introduced by James Mummert

Seconded by Manuel Garcia

WHEREAS, pursuant to the provisions of Section 12670 et. seq. of the Public Utilities Code, it is the function and duty of the Airport Land Use Commission of Alameda County, California, to prepare and adopt an airport land use plan to provide for the orderly growth of public use airports in this County and the areas surrounding these airports, and to safeguard the general welfare of the inhabitants within the vicinity of the airport and the public in general; and

WHEREAS, the Commission has adopted planning areas for the Metropolitan Oakland International Airport and the Livermore Municipal Airport on September 15, 1971; and adopted a planning area for the Hayward Air Terminal, on June 14, 1972; and

WHEREAS, the Commission adopted an Interim Bay Farm Island, Alameda, Land Use Plan on April 12, 1972, and amended said plan periodically through May 8, 1974; and

WHEREAS, changed conditions require the Commission to consider revision of said Interim Plan; and

WHEREAS, public hearings were held to consider adoption of the proposed Alameda County Airport Land Use Policy Plan on April 20, 1977; May 11, 1977; June 8, 1977; and July 13, 1977; and

WHEREAS, an Environmental Impact Report for the Policy Plan, December 7, 1976, as amended by Supplementary Environmental Impact Report, July 13, 1977, identified significant effects as defined in the California Environmental Quality Act; and

WHEREAS, the California Environmental Quality Act and State and local guidelines adopted pursuant thereto require this Commission to make findings where the EIR identifies one or more significant effects which would likely result from approval of the Plan; and

WHEREAS, the Commission does find that:

1. Changes or alterations have been incorporated into the Plan which mitigate the significant environmental effects thereof as identified in the EIR. These environmental effects and mitigation measures are listed in the document, "Alameda County Airport Land Use Policy Plan Environmental Impact Findings, July 13, 1977," a copy of which is attached hereto and is incorporated by reference in this resolution.

July 13, 1977 - Page 2

2. Some of the changes or alterations are within the responsibility of other public agencies and are not the responsibility of the Alameda County Airport Land Use Commission. Such changes either have been adopted by such agencies or can and should be adopted by other such agencies, which include but are not limited to those listed in the attached document.
3. Specific economic, social, and other considerations make infeasible mitigation measures or project alternatives identified in the EIR; these considerations are listed in the attached document and in the record of the Commission's hearings: Now Therefore

BE IT RESOLVED that this Commission does approve the Policy Plan as revised by the Commission dated July 13, 1977.

ADOPTED BY THE FOLLOWING VOTE:

AYES: Commissioners Abernathy, Field, Garcia, Mummert and Chairman McCall.

NOES: None

ABSTAIN: None

ABSENT: Commissioners Canaday and Scott.

WILLIAM H. FRALEY - ADMINISTRATIVE OFFICER

ALAMEDA COUNTY AIRPORT LAND USE POLICY PLAN
ENVIRONMENTAL IMPACT FINDINGS
AS REQUIRED BY CALIFORNIA ENVIRONMENTAL QUALITY ACT AND
ALAMEDA COUNTY GUIDELINES

This document is a portion of Alameda County Airport Land Use Commission Resolution #17, adopting the county-wide Airport Land Use Policy Plan. Pursuant to revised California Environmental Quality Act and local guidelines to implement CEQA, this document is intended to present findings and statements of facts, based on the public record, as to reasons the Airport Land Use Commission is taking this action in light of significant environmental effects thereof as identified in the Environmental Impact Report prepared for this project.

1. Significant Effect: The Plan acknowledges existing and projected aircraft noise exceeding normally acceptable levels¹ over existing development near the Hayward and Oakland airports. The Plan, however, does not cause such excessive noise levels.

Finding: Changes or mitigations are within the responsibility and jurisdiction of other public agencies. Such changes or mitigations can and should be adopted by these agencies.

Statement of Facts: Existing noise sensitive developments near the Hayward and Oakland airports are residential and thus are protected by the California airport noise standards, which place the burden of noise reduction and control on airport operators.² Under the standards, after 1985 airports are required to have a "zero impact area" -- no incompatible uses in areas exceeding 65 CNEL due to aircraft operations. Acceptable means of meeting the standards are listed in the Administrative Code Section 5011 (quoted on Plan EIR page 79) and include encouraging use of the airport by quieter aircraft, airport operational changes, and (least preferred) land use conversion. Uses on property subject to an aviation easement for noise are considered compatible.

The feasibility of meeting the standards by means of noise reduction depends in large measure on enforcement of federal requirements that aircraft be quieter (Federal Aviation Regulations Parts 36 and 91); at the present time (1977) FAA policy is to require compliance with the regulations by 1986.

Neither the Hayward Air Terminal nor the Oakland Airport has a plan to meet the airport noise standards by 1986. However, both the Hayward and Oakland Airports have already adopted certain noise abatement procedures (Plan EIR pages 42 and 49).

¹The California airport noise standards criterion level for residential development is 65 CNEL for all public use airports after 1985.

²California Administrative Code, Subchapter 6, Article 1.

August 10, 1977

Environmental Impact Findings - Page 2

2. Significant Effect: Plan Policy 16.4 could permit location of new residential development in aircraft noise zones exceeding the maximum normally acceptable level (65 CNEL) on Bay Farm Island.

Finding: Mitigations have been incorporated into the project to avoid significant environmental effects as identified in the Final EIR.

Statement of Facts: The California airport noise standards set 65 CNEL as the normally acceptable maximum noise level for residential areas, a criterion level also acknowledged by the State Office of Noise Control and incorporated into ALUC Plan policy 13. However, the airport noise standards also provide that regardless of CNEL, a use on property subject to a noise easement is "compatible," and the ALUC has been advised by the California Division of Aeronautics, which administers the standards, that this provision is considered valid for undeveloped land (Supplementary EIR, letter from Richard Dyer, Division of Aeronautics, dated June 3, 1977).

For consistency with provisions of the noise standards, the ALUC acknowledges in Policy 16.4 that new residential development may be allowed in noise zones subject to 65-70 CNEL if insulation requirements are met and if the property is subject to a noise easement. As identified on page 105 of the EIR, notification of prospective owners, which will be required with the easement, and adequate insulation mitigate noise impact.

Finding: For noise zones near the Oakland Airport, specific economic, social, and political considerations make infeasible policy alternatives identified in the Final EIR.

Statement of Facts: Alternatives to Policy 16.4 are identified in Plan/EIR page 107. Recognition of a policy which would allow new residential development within a 65-70 CNEL near MOIA has been advocated by the affected zoning jurisdiction (City of Alameda) and the Port of Oakland.

Moreover, policy 16.4 as it deals with noise easements, is intended to be consistent with the California airport noise standards, administered by the state Division of Aeronautics. The Division of Aeronautics maintains that, as written, noise standards section 5014(e) applies to both developed and undeveloped land (Supplementary EIR, letter from Richard Dyer, Division of Aeronautics, June 3, 1977). Recommendations from the Alameda City Council, Port of Oakland, and representatives of Harbor Bay Isle Associates have supported use of noise easements on Bay Farm Island (Supplementary EIR).

August 10, 1977

Environmental Impact Findings - Page 3

3. Significant Effect: Plan policies could permit new noise sensitive development in areas which, while outside recognized noise impact zones in the Plan, might in the future be exposed to high noise levels.

Finding: Such changes are within the responsibility and jurisdiction of another public agency and not the responsible agency making the findings. Such changes can and should be adopted by such other agency.

Statement of Facts: While the Policy Plan takes into account estimates of future noise consistent with regional planning and airport master plans, and while the Commission must review airport development plans for consistency with its Policy Plan, the Commission has no final jurisdiction over airport operations or growth; this responsibility rests with the airports (Plan EIR page 102). Required compliance with the state airport noise standards should protect residential development from airport noise exceeding 65 CNEL.



C124890446

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